INDEX NUMBER

METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD & COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

Volume 32, Number 12 DECEMBER, 1934 Two Dollars Per Year

Contents Advertising Page 4 — Publication Office: 116 John Street, New York, N. Y. — Buyers' Guide Advertising Page 35

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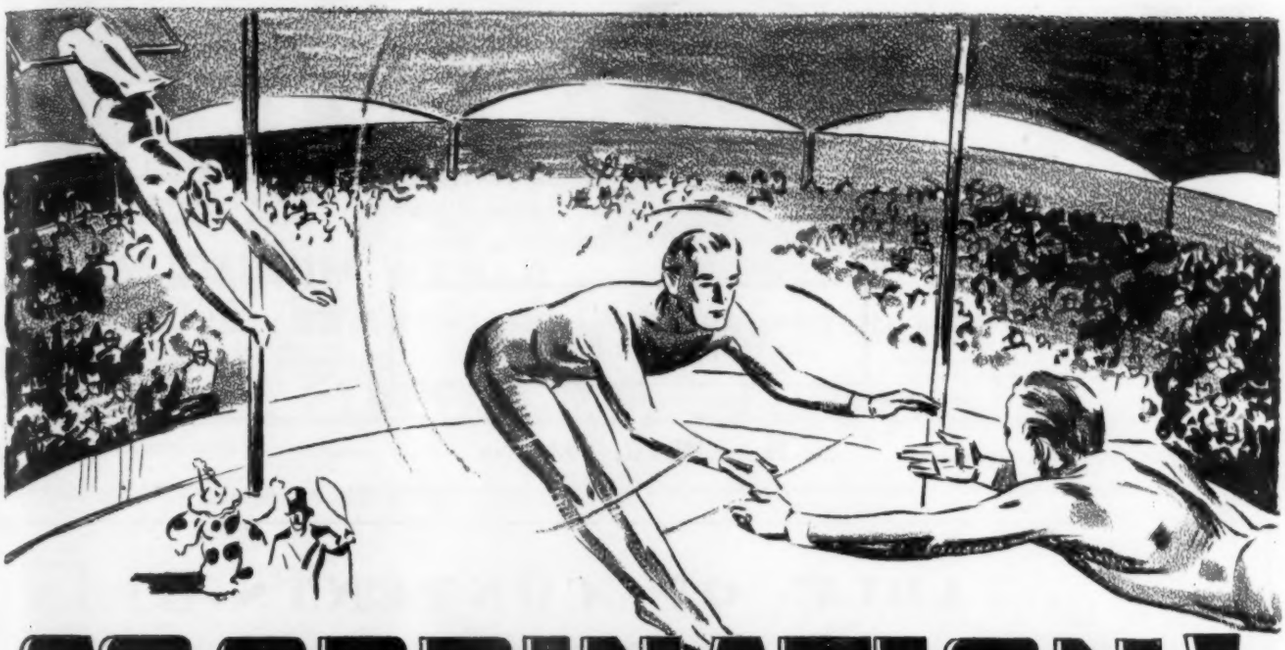

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ELECTRO-PLATERS REVIEW

VOL. 32 NEW YORK, DECEMBER, 1934 No. 12

Electro-Plating Research Goes Forward

Tentative Program of Exposure Tests of Plated Coatings on Non-Ferrous Metals, Including Some Comparisons With Plating on Steel and Iron.

AT A conference in New York on September 26, 1934, plans for this investigation were discussed and numerous suggestions were made regarding the base metals and the coatings. These have been incorporated into the following schedule, which is now being distributed for further consideration. Changes may then be made in the light of the comments received, or of experience gained during the plating operations. A few blank spaces have been left for additional sets that may be included before the exposures start, or for supplementary tests. Suggestions regarding this program and recommended cycles for cleaning and plating each metal should be sent to **W. Blum,** Bureau of Standards, Washington, D. C.

General Plan

All specimens will be 4 x 6 inches. The base metals will be obtained if possible in forms suitable for cleaning and plating, with at least one side uniformly polished. Suggestions regarding sources of such materials or offers to furnish or polish any particular base metals will be gladly received. It is expected that the required base metals, chemicals and anodes will be furnished without charge, as was done in the previous investigation.

All specimens will be plated at the Bureau of Standards under controlled conditions, so as to produce coatings of uniform quality and known thickness. They will all be exposed at the same time in six locations and inspected at intervals for corrosion or other evidences of failure. An additional number of each will be plated for use in accelerated and other laboratory tests.

The exact details of the cleaning and plating procedures will depend upon advice received and experience gained in preliminary tests. In general, they will follow closely the methods used by us for plating on steel, with such modifications as are required for specific base metals. In general, the effects of the composition and thickness of deposits will be studied with one metal of each group, such as brass, and only a few typical coatings will be applied to other alloys of that group.

Scope of Tests

The spaces for 112 sets will be used approximately as follows:

No. of Set	Base Metal	Form	Approx. Composition
7	Steel	Rolled	Continue present tests.
6	Steel	Rolled	Repeat present tests.
4	Steel	Rolled	Same steel, new coatings.
2	Steel	Rolled	Different cold-rolled steel.
2	Steel	Hot-Rolled	Spring steel.
2	Iron	Cast	Gray castings.
2	Iron	Cast	Malleable.
3	Copper	Deoxidized	Spinning copper.
6	Brass	Cast	High Brass A.S.T.M. B 65-28.
2	Brass	Cast	Ounce Metal. A.S.T.M. B 62-28. 85 Cu, 5 Zn. 5 Sn, 5 Pb.
2	Brass	Extruded	Leaded brass, A.S.T.M. B 16-29. 62 Cu, 3 Pb, 35 Zn.
14	Brass	Rolled	High Brass. A.S.T.M. B 36-33. 66-69 Cu, Bal. Zn.
2	Brass	Rolled	Low Brass, (B3-L). 85 Cu, 15 Zn.
5	Nickel-brass	Rolled	F.S.B., 65 Cu, 18 Ni, 17 Zn.

No. of Set	Base Metal	Form	Approx. Composition
5	Nickel-brass	Cast	F.S.B, 65 Cu, 20 Ni, 4 Sn, 5 Pb, 6 Zn.
6	Zinc	Rolled	Pure zinc.
6	Zinc-base	Die-Casting	A.S.T.M. XXI. 93 Zn, 3 Cu, 4 Al.
26	Zinc-base	Die-Casting	A.S.T.M. XXIII. 96 Zn, 4 Al.
10	Blank spaces		No.—63.5 Cu, 2.5 Pb, 34 Zn.
112			

Schedule of Deposits

1. Steel and Iron:

(a). (7 sets). Continuation of Present Exposures. A few specimens of typical sets that have not yet failed in a given location will be retained to determine their approximate life. The sets selected may be different in different locations.

(b). (6 sets). Repetition of Old Tests. These will be made on steel exactly like that used in 1931, as follows:

No.	Description	Copper	Thickness[1], inch Nickel[2]	Chromium
S 1	Ni	..	100	2
S 101	Ni,Cr	..	100	2
S 110	Cu*(CN),Ni,Cr	50	50	2
S 113	Ni,Cu(A),Ni,Cr	30	20 50	2
S 106	Ni,Cr	..	200	2
S 116	Ni,Cu(A),Ni,Cr	60	40 100	

*—Buffed.
[1]—To avoid confusion of decimal places, all thicknesses of deposits are expressed in hundred-thousandths of an inch.
[2]—All final coatings will be buffed prior to chromium plating.

(c). (4 sets). New Coatings on Same Steel.

No.	Description	Copper	Nickel	Chromium	Variable
S 171	Ni, Cu (A), Ni, Cr	50	20 30	2	Decrease final nickel (cf 113)
S 172	Ni, Cr	..	100	5	Thickness Cr (101)
S 173	Ni, Cr	..	100	10	Thickness Cr (101)
S 174	Ni, Cr	..	200	10	Thickness Cr (106)
	(d). (4 sets). Different Steels.				
S 181	Ni, Cr	..	100	2	New cold rolled steel
S 182	Ni, Cu (A), Ni, Cr	30	20 50	2	New cold rolled steel
S 191	Ni, Cr	..	100	2	Spring steel
S 192	Ni, Cu (A), Ni, Cr	30	20 50	2	Spring steel
	(e). (4 sets). Cast Iron.				
I 1	Ni, Cr	..	100	2	Gray cast iron
I 2	Cu* (CN), Ni, Cr	50	50	2	Gray cast iron
I 3	Ni, Cr	..	100	2	Malleable cast iron
I 4	Cu* (CN), Ni, Cr	50	50	2	Malleable cast iron

2. Copper and Brass:

	(a). (3 sets). Copper.				
C 1	Ni, Cr	..	20	2	Standard
C 2	Ni, Cr	..	50	2	Thickness Ni
C 3	Ni, Cr	..	50	2	Preparation
	(b). (6 sets). Cast High Brass.				
B 1	Ni, Cr	..	20	2	Standard
B 2	Ni, Cr	..	10	2	Thickness Ni
B 3	Ni, Cr	..	50	2	Thickness Ni
B 4	Ni, Cr	..	20	1	Thickness Cr
B 5	Cu* (A), Ni, Cr	20	30	2	Copper
B 6	Ni, Cr	..	20	2	Preparation
	(c). (2 sets). Cast Low Brass (Ounce Metal).				
B 11	Ni, Cr	..	20	2	Standard
B 12	Ni, Cr	..	10	2	Thickness Ni
	(d). (2 sets). Extruded Brass.				
B 21	Ni, Cr	..	20	2	Standard
B 22	Ni, Cr	..	10	2	Thickness Ni
	(e). (14 sets). Rolled High Brass.				
B 31	Ni, Cr	..	20	2	Standard
B 32	Ni, Cr	..	10	2	Thickness Ni
B 33	Ni, Cr	..	30	2	Thickness Ni
B 34	Ni, Cr	..	50	2	Thickness Ni
B 35	Ni, Cr	..	20	1	Thickness Cr
B 36	Ni, Cr	..	20	3	Thickness Cr
B 37	Ni, Cr	..	20	5	Thickness Cr
B 38	Ni	..	20	..	No Cr
B 39	Cr	..	..	10	No Ni
B 40	Cu* (CN), Ni, Cr	10	20	2	Cu (CN)
B 41	Cu* (A), Ni, Cr	10	20	2	Cu (acid)
B 42	Ni, Cr	..	20	2	Preparation
B 43	Ni, Cr	..	20	2	Preparation
B 44	Ni, Cr	..	20	2	Preparation

No.	Description	Copper	Nickel	Chromium	Variable
	(f). (2 sets). Rolled Low Brass.				
B 51	Ni, Cr	..	20	2	Standard
B 52	Ni, Cr	..	10	2	Thickness Ni
	(g). (5 sets). Rolled Nickel Brass.				
N 1	Cr	..	..	20	Standard
N 2	Cr	..	..	10	Thickness Cr
N 3	Cr	..	..	5	Thickness Cr
N 4	Ni, Cr	..	10	10	Thickness Ni & Cr
N 5	Ni, Cr	..	20	2	Thickness Ni & Cr
	(h). (5 sets). Cast Nickel Brass.				
N 11	Cr	..	..	20	Standard
N 12	Cr	..	..	10	Thickness Cr
N 13	Cr	..	..	5	Thickness Cr
N 14	Ni, Cr	..	10	10	Thickness Ni & Cr
N 15	Ni, Cr	..	20	2	Thickness Ni & Cr
	3. Zinc and Zinc Base Die-Castings:				
	H. S.=high sulphate, C=citrate, S=standard.				
	(a). (6 sets). Sheet Zinc.				
Z 1	Ni (H.S.), Cr	..	50	2	Standard
Z 2	Ni (H. S.), Cr	..	20	2	Thickness Ni
Z 3	Ni (H. S.), Cr	..	50	1	Thickness Cr
Z 4	Ni (H. S.), Cr	..	50	3	Thickness Cr
Z 5	Ni (H. S.), Ni (S), Cr	..	{20 {30	2	Duplex Ni
Z 6	Cu (CN)*, Ni (S), Cr 20	20	30	2	Copper layer
	(b). (6 sets). Die-Castings, A. S. T. M. XXI.				
Z 11	Ni (H. S.), Cr	..	50	2	Standard
Z 12	Ni (H. S.), Ni (S), Cr	..	{20 {30	2	Duplex Ni
Z 13	Ni (H. S.), Ni (S), Cr	..	{20 {80	2	Duplex Ni
Z 14	Cu (CN)*, Ni (S), Cr	20	30	2	Copper layer
Z 15	Cu (CN)*, Ni (S), Cr	20	80	2	Copper layer
Z 16	Cr	..	..	20	Direct Cr
	(c). (26 sets). Die Castings, A. S. T. M. XXIII.				
Z 21	Ni (H. S.)	..	50	..	Standard Ni
Z 22	Ni (H. S.)	..	20	..	Thickness Ni
Z 23	Ni (H. S.), Cr	..	50	2	Standard Ni, Cr
Z 24	Ni (H. S.), Cr	..	20	2	Thickness Ni
Z 25	Ni (H. S.), Cr	..	50	1	Thickness Cr
Z 26	Ni (H. S.), Cr	..	50	3	Thickness Cr
Z 27	Ni (H. S.), Cr	..	50	2	Preparation
Z 28	Ni (H. S.), Cr	..	50	2	Acid dip
Z 29	Ni (C), Cr	..	20	2	Citrate Ni
Z 30	Ni (C), Cr	..	50	2	Citrate Ni
Z 31	Cr	..	..	20	Direct Cr, hot
Z 32	Cr	..	..	50	Direct Cr, hot
Z 33	Cr	..	..	20	Direct Cr, cold
Z 34	Cr	..	..	50	Direct Cr, cold
Z 35	Ni (H. S.), Ni (S), Cr	..	{20 {30	2	Duplex Ni
Z 36	Ni (H. S.), Ni (S), Cr	..	{20 {30	1	Thickness Cr
Z 37	Ni (H. S.), Ni (S), Cr	..	{20 {80	2	Thickness Ni
Z 38	Ni (H. S.), Ni (S), Cr	..	{20 {180	2	Thickness Ni
Z 39	Ni (H. S.), Ni (S), Cr	..	{20 {30	2	Preparation
Z 40	Cu* (CN), Ni (S), Cr	20	30	2	Initial copper layer
Z 41	Cu* (CN), Ni (S), Cr	30	70	2	Thickness Cu, Ni
Z 42	Cu* (CN), Ni (S), Cr	50	150	2	Thickness Cu, Ni
Z 43	Cu* (CN), Ni (S), Cr	30	20	2	Ratio Cu/Ni
Z 44	Ni (H. S.), Cu (CN)*, Ni (S), Cr	20	{10 {20	2	Inter. Copper layer
Z 45	Ni (H. S.), Cu (CN)*, Ni (S), Cr	30	{20 {50	2	Thickness
Z 46	Ni (H. S.), Cu (CN)*, Ni (S), Cr	80	{20 {100	2	Thickness

The Effect of Some Mill Variables on the Gauge of Sheet Brass

C. K. SKINNER

General Electric Company, Bridgeport, Conn.

In General the Variables Encountered in Mill Practice Which Greatly Influenced the Gauge of the Sheet Metal Were: 1. The Roller's Ability; 2. The Heat of the Rolls; 3. The Width of the Metal; 4. The Reduction Per Pass; 5. The Temper of the Metal. Those Which Had Little Bearing Were: 1. The Speed of Rolling (Within Stated Range); 2. Variations in Cast or Overhauled Bar; 3. Oxidation from Anneal. Part 3*

4. The effect of width of bars.

According to rollers, it is more difficult to roll wide metal to gauge than narrow metal. Inasmuch as the wide work presents more friction surface than the narrow for the same size roll, it seems reasonable to expect this, and especially considering the difference in roll pressures.

Ten bars, five of 9½" high brass and five of 4½" high brass of the same chemical composition were taken at stock size and rolled to .072"; there the gauges of the two widths were comparatively uniform. In this rolling the wide bars received more passes than the narrow according to standard rolling practice. After an anneal, the bars were again rolled by standard practice to .040". The gaugings are here given:

NARROW BARS

Stuck:	.0415	.0425	.0430	.0430	.0425	.0410
Last:	.0395	.0400	.0410	.0410	.0400	.0390
	.0405	.0510	.0420	.0420	.0405	.0395
	.0400	.0400	.0410	.0410	.0400	.0395
	.0410	.0425	.0430	.0430	.0425	.0410
	.0415	.0420	.0420	.0420	.0415	.0400
	.0410	.0425	.0425	.0425	.0415	.0410
	.0390	.0400	.0410	.0410	.0400	.0390
	.0400	.0420	.0425	.0425	.0420	.0405
	.0395	.0400	.0410	.0410	.0400	.0395

WIDE BARS

.0410	.0425	.0425	.0425	.0425	.0415
.0410	.0425	.0430	.0430	.0425	.0410
.0410	.0420	.0430	.0420	.0420	.0410
.0400	.0415	.0415	.0415	.0415	.0405
.0410	.0425	.0425	.0425	.0425	.0410
.0410	.0425	.0430	.0430	.0435	.0415
.0410	.0430	.0430	.0430	.0430	.0415
.0405	.0420	.0425	.0425	.0420	.0405
.0415	.0430	.0440	.0445	.0435	.0420
0410	.0420	.0425	.0425	.0420	.0410

*Parts 1 and 2 were published in our August and September issues.—Ed.

NARROW BARS

Ave. Stuck:	.0408	.0421	.0426	.0426	.0417	.0406
Ave. Last:	.0399	.0404	.0412	.0412	.0403	.0394
% Vari. Stuck:	2.0	5.0	6.5	6.5	4.0	1.5
% Vari. Last:	0.2	0.7	3.0	3.0	0.6	1.0
Ave. Stuck:	.0411	.0426	.0430	.0429	.0427	.0416
Ave. Last:	.0407	.0421	.0425	.0425	.0421	.0409
% Vari. Stuck:	2.9	6.5	7.5	7.0	6.6	4.0
% Vari. Last:	1.5	5.0	6.0	6.0	5.0	2.0

And the Indices were:

	Narrow	Wide
Batch Variation	.004"	.0045"
Greatest Bar Variation	.0035"	.0035"
Least Bar Variation	.002"	.002"
Ave. % End to End Variation	3.23	1.5

These ten were then run in the same pass, set and stand to .032". The gaugings follow:

WIDE BARS

Last:	.033	.0335	.034	.034	.034	.0335	.032
Stuck:	.033	.034	.0345	.0345	.034	.034	.033
	.033	.034	.0345	.0345	.034	.0335	.033
	.032	.0335	.034	.034	.0335	.033	.0325
	.033	.0335	.034	.034	.034	.0335	.033
	.032	.033	.033	.033	.033	.032	.031
	.0325	.034	.034	.0345	.034	.0335	.0325
	.033	.0345	.035	.035	.035	.0345	.0325
	.033	.0345	.0345	.035	.0345	.0345	.033
	.033	.034	.0345	.034	.034	.034	.033
Ave. Last:	.0329	.0339	.0342	.0344	.0341	.0337	.0327
Ave. Stuck:	.0326	.0328	.0341	.0342	.0339	.0335	.0324
% Vari. Last:	2.8	6.0	6.0	8.0	6.4	5.1	2.1
% Vari. Stuck:	2.0	5.6	6.4	6.9	6.0	4.6	1.0

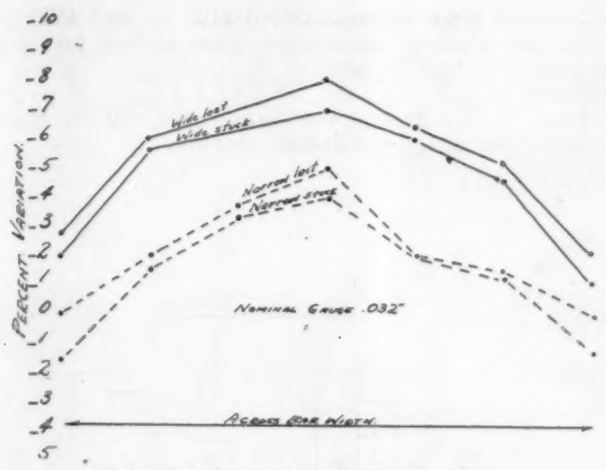

Fig. 7. Effect of Bar Width on Gauge

NARROW BARS

Last:	.031	.032	.0325	.033	.0325	.032	.031
Stuck:	.0315	.032	.0325	.033	.033	.0325	.032
	.032	.0325	.033	.0335	.033	.033	.032
	.0315	.0325	.033	.033	.0325	.032	.032
	.032	.033	.0345	.035	.0335	.033	.032
	.033	.0335	.034	.0345	.034	.034	.033
	.0315	.0325	.033	.033	.0325	.032	.0315
	.032	.033	.033	.033	.0325	.032	.031
	.031	.0325	.033	.0335	.0325	.032	.0315
	.032	.0325	.033	.033	.0325	.032	.032
Ave. Last:	.0315	.0325	.0332	.0336	.0327	.0324	.0316
Ave. Stuck:	.032	.0327	.0331	.0333	.0329	.0325	.032
% Vari. Last:	1.5	1.5	3.7	5.0	2.0	1.3	1.2
% Vari. Stuck:	0	2.0	3.3	4.0	2.5	1.5	0

The Indices of the two lots:

	Wide	Narrow
Batch Variation	.004	.005
Greatest Bar Variation	.003	.0035
Least Bar Variation	.0015	.002
Ave. % End to End Variation	.67	.73

From the above indices it would seem that the wide metal could be rolled a trifle more accurately than the narrow, but considering the better measure of accuracy, the % variation from the nominal gauge, Fig. 7, it will be seen that the narrow bars were rolled with considerably greater accuracy. The wide bars were slightly over the upper limit, whereas the narrow bars were within the limits. Check runs were made at various reductions and practically duplicated the variation curves here obtained.

Hence—

Point 4. Given the same conditions it is more difficult to accurately roll wide bars than narrow ones.

5. **Effect of the Speed of Rolling Upon the Gauge of Sheet.**

Finishing rolls travel at varied lineal speeds. The question naturally arises as to whether a more accurate gauge could be obtained on a fast or a slow speed roll. In order to test this a batch of 25 bars was split in two sections. One was run at a lineal speed of 185 feet per minute, the other at 235 feet per minute, sections of each were given different passes. Fig. 8 is a graphical analysis of the results of this procedure. In both cases, one pass and three pass work, the indices for the slower speed rolls show a better uniformity.

Another set of tests yielded gaugings as depicted on the graphical analysis to be found on Fig. 9. Here the indices of the faster speed rolling are indicative of greater uniformity.

As a result of these two contradictory tests, several others were made on process batches. It was impossible to determine and direct advantage one way or another for the difference in speed. The finish stands ran within a 50 ft. per minute range in these tests.

Hence—

Point 5. That the difference in speed of 50 ft on finish mills has no effect on the resultant gauge.

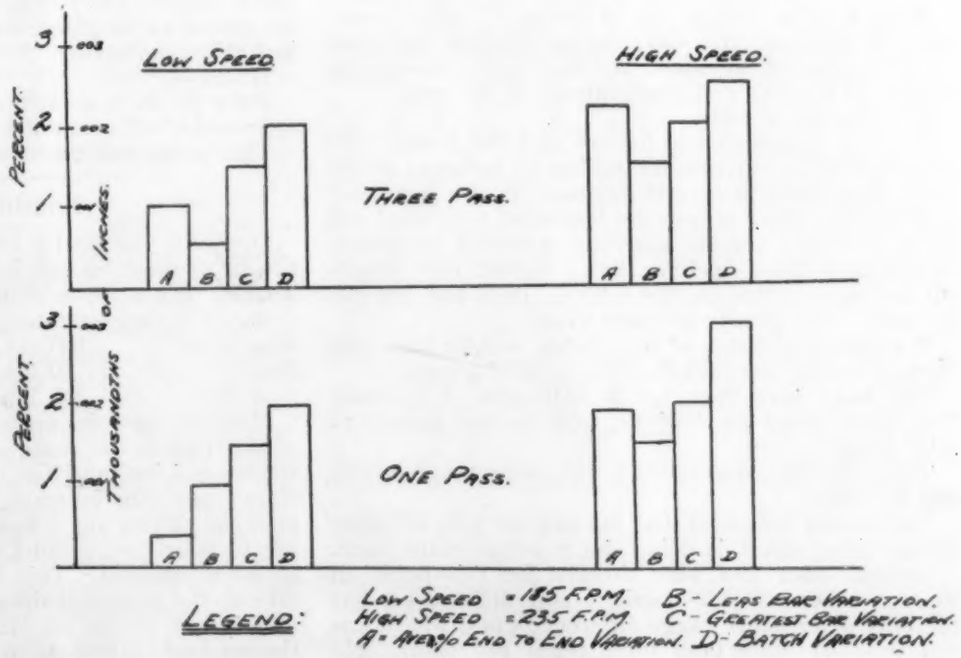

Fig. 8. Effect of Roll Speed on Gauge

6. **The effect of the Heat Generated in Rolling.**

A. **Shape of rolls.**

It has been previously stated in this paper what principles governed the shaping of these rolls and how that shape was changed as the roll absorbed the heating of the rolling. What definite influence on the gauge of sheet the shape of roll has is here pointed out. For equal reductions, gauges, tempers, etc. two lots were rolled; one on the center of a .005" crown roll, the other in a track off-set from the center.

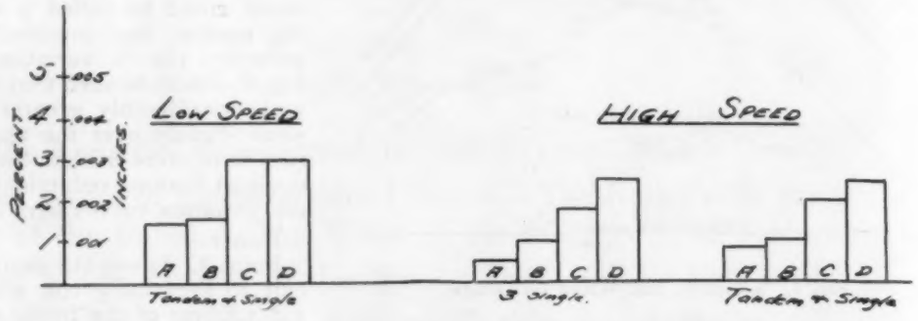

Fig. 9. Effect of Roll Speed on Gauge
(See Fig. 8 for legend)

Twenty-five bars of 5" x .128" high brass were rolled to .051" in the track. They were then annealed and finished to .03196" in the same track 4 numbers hard. The width of the track was 7" and the depth .002".

It was located as to center line about 5" from the start of the neck, i. e., it was not in the center of the roll face.

The same number of bars were given the same treatment as those just mentioned on the same stand and by the same roller, except that the bars were rolled on the center of a roll with approximately a .005" crown.

The percent variation from the nominal gauge for both rollings is plotted on curve 15 and 16. The curves show, as do the indices that the batch rolled in the track was slightly more uniform. Both batches were fairly flat and straight. The same was found to be true of other lots rolled on various shapes.

Hence—

Point 6. The average run of shapes of rolls encountered in mill practice have no appreciable influence on the gauge of the sheet, but materially change the degree of flatness and straightness of the metal.

B. **Weight of rolls.**

It seems reasonable to believe that the heavy rolls would be more suitable for rolling to accurate gauge than light rolls, not only because of the increased rigidity, but also because the increased weight of roll material would provide a greater reservoir for generated heat without swelling than a lighter roll. Identical lots were rolled on the 4500 lb. rolls and the 900 lb. rolls. The results are here given.

A production batch of ten double weight bars was "gotten ready" on 4500 lb. rolls at .025" gauge.

The bars were then cut in half after the anneal. Ten were rolled on 4500 lb. rolls in two passes to .015" gauge.

The other ten were rolled to the same gauge on the 900 lb. rolls.

The results indicated that the heavier roll, all other things being equal, is doing the more accurate work.

Several other lots were checked for this point on various other rolls and weight and differences, but the only discernable gauge difference came where one roll weighed more than three times the other. No differences were found between 3100 lb. and 4500 lb. rolls, but distinct advantages were shown for 3100 lb. rolls over 900 lb. rolls.

Hence—

Point 7. The greater the mass of the roll the more accurate the gauge obtainable thereon.

C. **Lubrication of Necks.**

Several test runs were made in an effort to determine what good or bad neck lubrication did to the gauge of the metal being rolled. Out of the five tests made, only two indicated anything definite. These were lots of 5" x .005". Each lot consisted of 50 bars and was split into two sections of 25 each. Half of each lot was rolled when the bearings had not been lubricated and during the active pass the ammeter on the roll motor was exceeding the allowed maximum. The other half was rolled on the same set but oiling the bearings twice during the run of each bar. All bars had the same end to end variation at ready—about 4%. Those bars rolled with necks lubricated had an 11% end to end variation after rolling whereas the lubricated neck rolled bars had only 5% end to end variation.

Hence—

Point 8. That the lubrication of necks seems to have an effect on the end to end variation.

D. **Roll Material.**

All other variables kept as constant as possible, tests were made on steel and cast iron rolls of the same shape. The rolling of 50 bars on each revealed no difference in gauge uniformity. Check runs verified this conclusion.

Hence—

Point 9. In general the material of the roll has no appreciable effect on the gauge of the sheet.

This series will be concluded in an early issue—Ed.

Smelting Flux

Q.—Will you kindly advise us as to the best fluxes to use in smelting our lead base, tin base and solder drosses in a reverberatory furnace.

A.—We suggest that you use a flux composed of

iron scale	100 lbs.	silica sand	75 lbs.
lime	50 lbs.	soda ash	15 lbs.
coal dust	200 lbs.	fluorspar	50 lbs.

Mix this material up well and add from 10 to 20% of this flux to the charge. The iron will throw down the tin and lead and flux off with the slag. If the slag shows any tin, increase the iron content. If your material carries any copper, add 100 pounds of Galena ore to your flux, ground up fine, and mixed with the above mentioned. This flux should form a mat and take up the copper as the copper goes after the sulphur and is run off in the slag, and the iron throws the tin and lead to the bottom.—**W. J. Reardon.**

A Study of the Structure of Electro-Deposited Metals

By L. B. HUNT

FROM THE JOURNAL OF PHYSICAL CHEMISTRY, VOL. XXXVI, pp. 1006-1021, MARCH, 1932.
ABSTRACTED by DR. A. K. GRAHAM

A Critical Review of the State of our Knowledge of the Factors Which Influence the Structure of Electrodeposited Metals, and a Working Hypothesis to Account for the Observed Variations in Structure with Differing Conditions of Deposition and Amongst the Various Metals and their Salts.—Conclusion*

Contents of the Cathode Layer

The composition of the cathode film in the type of aqueous solution normally used for electrodeposition may now be considered. The following scheme represents the various ionic and molecular species, and the directions in which they are moving with respect to the cathode.

APPROACHING	AT RANDOM	LEAVING
Metal ions	Undissociated molecules	Anions
Other cations (H; K; etc.)	Solvent-water molecules	Complex anions
Complex cations		Water dipoles
Water dipoles		
Colloidal bodies		

(It is assumed that the only colloidal particles which need be considered are those which migrate towards the cathode.)

The removal of metal ions from the cathode layer will be compensated by such processes as migration, diffusion, convection, and agitation, and at the critical current density an equilibrium will exist such that equal quantities of metal ions are deposited from the cathode film, and brought into it, in a given time. Below the critical current density the compensating processes will be able to supply ions at the same speed as they are deposited, and thus the velocity of the compensating processes must increase with the velocity of deposition. Glasstone[48] has recently published a mathematical relationship connecting speed of diffusion, and limiting current density with the concentration of electrolyte.

Increase of temperature will increase the rates of diffusion and convection, and also reduce the thickness of the diffusion layer, so favoring the rapid attainment of equilibrium and increasing the limiting current density. Agitation will play a similar part to increase of temperature. The important factor in this cathode layer is of course the concentration of metal ions therein. This fact has been recognized by the previous workers in the subject, but the suggestions now to be put forward are based on the relation between this metal ion concentration and the concentration of the other ions and molecules in the cathode layer.

The Interference Theory

The hypothesis which is suggested by the writer may be briefly set out as follows:—

"The crystalline structure of an electrodeposited metal will be governed by the relation of the metal ion concentration in the cathode film to the concentration of the other constituents of that film. If the proportion of metal ions to inert particles is comparatively high, there will be little interference with crystal growth, and coarsely crystalline deposits will result. If, however, the proportion is low, due to low degree of dissociation, complex ion formation, high hydration of the metal ions, or the presence of colloidal matter that has migrated cataphoretically into the film, or has been joined therein, there will be considerable interference with crystal growth, with the consequent formation of many nuclei. Thus any change in the conditions of deposition which restricts the supply of metal ions to the cathode film whilst allowing that of the other particles to remain unaltered, will cause a diminution in the grain size of the deposit.

"The mechanism of deposition according to this view will now be considered. A metal ion on approaching the cathode will seek to enter the lattice as soon as possible, and in order to do so it must lose (a) its ionic atmosphere and (b) its water envelope. It is conceivable that a metal ion may actually arrive on the lattice whilst still retaining part of its atmosphere or of its water sheath. The more rapidly a layer is built up, and deposition continued over the ion in question, the less chance will these other bodies possess of escaping back into the solution. The precise manner of cohesion of these particles to the lattice cannot be postulated at present, and no good purpose would be served by attempting to label the process 'adsorption' or 'van der Waals' cohesion' in the present state of our knowledge. There is, however, ample evidence that such forms of cohesion may occur, and in this way the inclusion in the deposit of water dipoles, complex cations, or undissociated molecules may take place. The colloidal bodies frequently added to depositing solutions will behave in an exactly similar manner. Further, colloidal hydroxides which have been formed by precipitation, have been found by O'Sullivan[49] to enter the deposit and influence its structure, and it is also known that hydrogen can be co-deposited with several metals, including iron, nickel,

*Parts 1 and 2 were published in our September and November issues. All references are published at the end of this installment.—Ed.

cobalt and chromium, and so disturb the regular arrangement."

Following the statement of the interference theory, the author attempts to explain the manner in which this hypothesis fits the facts of the case and enables one to predict a variation in structure. He states that variations in structure may be due to the properties of the metal, the properties of the anion, the external conditions of deposition such as, current density, temperature, agitation and the presence of colloidal matter.

In a second paper, designated at Part II of the previous paper (**The Journal of Physical Chemistry**, Vol. XXXVI, pp. 2259-2271, August, 1932), the author states, "the present communication constitutes an attempt to elucidate this mechanism by means of a further and more detailed consideration of the processes occurring at the interface between cathode and electrolyte, in conjunction with the published data on the inclusion of foreign bodies within electrodeposits. In order to arrive at definite conclusions, it has been necessary to start from the fundamental mechanisms of crystal growth and metallic cohesion, with particular reference to the concept of the two-dimensional lattice, and thence to develop a mechanical picture of the formation of this lattice from a more highly disperse phase during cathodic deposition. The ground having been cleared in this way, two further lines of thought have been developed. In the first place the problem has been treated as a case of surface chemistry. The interface cathode-electrolyte presents unusual and complicating features which render generalization difficult. The constant renewal of surface which is occurring is particularly favorable to adsorption, but various bodies are present which may be adsorbed to a greater or less extent. Several workers have ascribed the influence of substances such as gelatin to adsorption but have given no clear indication of the manner of this adsorption.

"Secondly, the two-dimensional lattice idea has been further considered, and a new concept has been introduced of a two-dimensional lattice distortion, leading to changes of orientation and consequent refinement of grain. This concept has been applied to the data on the electro-deposition of alloys and of those metals with which hydrogen is co-deposited. Two distinct types of interference have thus been recognized, occurring respectively between, and during, the formation of the two dimensional lattices. It is fairly certain, however, that the transition from one to the other is not discontinuous in such cases as the discharge of complex cations and solvent sheaths, i. e., when the interfering particles are already attached to the metal ions. There is also the possibility, of course, of both types of interference occurring in any one case.

"A number of investigators have referred to two other processes as influencing the structure of electrodeposited metals, viz. cataphoresis, and 'mechanical inclusion' of the electrolyte or of colloidal particles. Now although cataphoresis may account for the arrival of particles at the cathode some such process as adsorption must be brought into play to cause their ultimate cohesion to the cathode, whilst mechanical inclusion is of doubtful existence, and in any case has no fundamental bearing on the problem in hand. These two processes have therefore been omitted from consideration at the present time."

The author discusses in a very comprehensive manner the mechanism of lattice formation. He assumes the existence of an adsorption layer as postulated by Volmer and states, "the existence of an adsorption layer of metal ions on the surface of a cathode is a reasonably justifiable assumption in view of the work of Langmuir and others, coupled with the much older concept of a double layer due to Helmholtz and Lippman. By making this assumption, however, the problem of the manner in which the layer is formed and maintained is still left unsolved. Presumably metal ions in the vicinity of the cathode will frequently be in collision with the cathode surface, and will tend to adhere thereto, prior to the passage of a current, although this will apply in greater or less degree to all ionic and molecular species present. On passing a current, however, the anions will be repelled violently, leaving an adsorbed layer of cations from which deposition can take place provided the potential requirements are satisfied. As deposition removes the metal ions the layer must be replenished by the process of diffusion. The process of deposition can therefore be roughly represented thus:

Diffusion—Adsorption—Lattice formation

"The final velocity will naturally be governed by the slowest stage in the process. The speed of diffusion will be determined by the concentration gradient across the diffusion layer, as also will the speed of adsorption. Increase of temperature, agitation of the solution and decrease of current density will thus promote diffusion, and adsorption from the diffusion layer. The concentration gradient, however, will depend upon the amount of deposition occurring, and thus on the current flowing. The delivery of electrons at the cathode surface is thus the determining factor, but certain complexities are introduced when the mechanism of this proecss is considered."

A further consideration of such matters as the electron theory of metals and metallic cohesion, interfacial phenomena, the inclusion of basic matter in deposits and the deposition of foreign cations constitutes the greater part of this paper. As a result of these studies, the author's conclusion will be of general interest.

The various types of interference with lattice formation which have been described are shown diagrammatically in Fig. 3 which represents the passage of the ionic and molecular species from the electrolyte to the cathode.

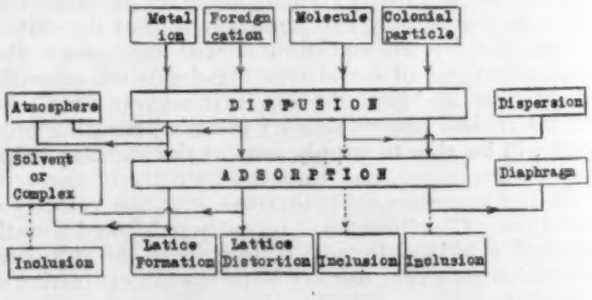

Fig. 3. The Processes Occurring at a Cathode

Continuous lines indicate the major process, and broken lines the processes of infrequent occurrence. The branching lines indicate the removal of certain types of ions and molecules from the cathode layer. Thus the first event on the approach of a cation to the cathode will be the loss of its anionic atmosphere, which will be followed by the loss of the solvent sheath or the complex portion of the ion. The latter may, as shown, remain adsorbed to a slight extent and thus be included in the deposit. The difference between the removal of molecules and colloidal particles is also indicated. Mol-

ecules adsorbed from the cathode will return into solution, whereas colloidal matter will not, and may accumulate temporarily as a diaphragm a short distance from the cathode, prior to its redistribution by diffusion or electrophoresis. Further, certain colloidal particles, more particularly those consisting of basic matter, will be adsorbed more firmly and in greater amount owing to their attachment to the metal ion, and will behave in a similar manner to complex ions.

The theory of interference with crystal growth proposed by the writer II (1) receives considerable support from the lines of thought which have been developed in this paper. It is clear that no simple hypothesis, such as that based on changes in polarisation, can be expected to account for the variations in structure of electrodeposited metals. Each species present in the electrolyte must be considered on its own merits with respect to the forces acting upon it, and its behaviour under these forces. It is considered that the adoption of this method has resulted in a more detailed insight into the mechanism of interference with crystal growth, and although the writer hopes to be able to present experimental data and more exact information bearing on the relative potency of the interfering bodies, it is his opinion that the first essential is an attempt to present a clear and logical account of the subject. By applying existing knowledge in the coordination of the available data and the further development of the hypothesis it is hoped that this object has been achieved.

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New Specifications for Copper-Silicon Alloy Products

ON THE recommendation of its Committee B-5 on Copper and Copper Alloys, Cast and Wrought, the American Society for Testing Materials has just approved for publication as tentative, three specifications covering (a) copper-silicon alloy plates and sheets (B 96—34 T); (b) sheet copper-silicon alloy (B 97—34 T); (c) copper-silicon alloy rods, bars and shapes (B 98—34 T). The committee has been working on these for some time in view of the increasing requests from various sources for standardized requirements.

The three specifications have the same chemical composition requirements. This involves a silicon range of from 1 to 5 per cent and the following maximum percentages of the respective metals: Manganese, 1.50; zinc, 5.00; iron, 2.50; tin, 2.00; aluminum, 2.00; with copper the remainder. In the case of the specifications for sheets which are commonly used for drawing, forming, stamping and bending, the minimum tensile strength requirement in the case of soft material is 50,000 lb. per sq. in., with an elongation of 35 per cent in 2 in. On half-hard material corresponding figures are 70,000 and 10 per cent, while for hard material the minimum tensile strength is to be 80,000 lb. per sq. in. and elongation in 2 in. of 5 per cent.

The minimum tensile strength for the plates and sheets used for pressure vessels is 55,000 lb. per sq. in., yield point, 22,500 with minimum elongation in 2 in. of 40 per cent and in 8 in. of 25 per cent.

There are varying requirements for the specifications covering copper-silicon alloy rods, bars and shapes, depending on the form of the material. The minimum tensile strength in the case of rods varies from 50,000 for soft material in all sizes to 90,000 lb. per sq. in. for hard material over ¼ in. to 1 in. inclusive in diameter. For bars, tensile strength ranges from 50,000 to 65,000 lb. per sq. in., while for shapes, soft temper, all sizes, the minimum tensile strength is 50,000 lb., but for hard temper in all sizes the physical requirements are to be matters of agreement between manufacturer and purchaser.

Tentative revisions have been approved for publication as tentative in the Standard Specifications covering Steam or Valve Bronze Sand Castings (B 61—28), Composition Brass or Ounco Metal Sand Castings (B62—28) and Sand Castings of the Alloy: Copper 88 per cent; Tin 8 per cent; Zinc 4 per cent (B 60—28), while the Standard Specifications for the Alloy: Copper 88 per cent; Tin 10 per cent; Zinc 2 per cent (B 10—18) have been withdrawn.

In line with reports of an investigation on the aluminum content of Alloy XXIII covered in the Specifications for Zinc-Base Alloy Die Castings (B 86—33 T), the maximum limit for aluminum has been lowered from 4.5 to 4.3 per cent.

All of the above actions were accepted by Committee E-10 on Standards at its August meeting.

Bright Nickel

By L. ECKELMANN
Pyrene Manufacturing Company, Newark, N. J.

The Requirements of the Deposit; Properties of the Electrolyte; Methods of Operation; Economies Effected by a New High-Gloss Solution.*

IN VIEW of the great interest manifest by the electroplating industry in bright deposits of nickel and other metals, and the recent very marked progress made with bright plates, I believe it timely to present to this body some information on this development, particularly as regards nickel, which metal is used perhaps in greater quantities than any other in the plating industry. The extent to which nickel is consumed may be gathered from a study of the following:

According to figures given in the **Metal Industry** of June, 1934, the world consumption of nickel in 1933 totaled approximately 96 million pounds. The consumption in the United States and Canada totaled approximately 57 million pounds, or roughly about 60% of the world production. In the United States there were from five to six million pounds of nickel used by the plating industries, mostly for decorative and protective purposes.

Though brilliant electro-deposits of nickel have been obtained commercially for quite some time, it is important before enlarging on this subject to define, in at least outline form, certain characteristics of the deposit and the electrolytes, to serve as a basis for comparing recent progress with past results. It is also obvious that this comparison should be based more on commercial practice than on results obtained on a laboratory scale.

Let us, then, attempt to define and specify the requirements as to deposit, also operating properties of any electrolyte producing bright nickel:

The Electrolyte

(a) It must be stable upon continued and intensive use.
(b) It must have a wide operative range as to pH, concentration, temperature and other variables.
(c) It must possess high cathodic and anodic efficiency.
(d) It should produce a bright plate of maximum brilliance at current densities at least as high as those now commonly used and, if possible, at higher ones.
(e) It must have high throwing power.
(f) It should be least sensitive to contaminants, both organic and inorganic.
(g) It must be simple to control.
(h) It should be readily adaptable to corrective and purification methods.

The Deposit

(a) It must possess maximum brilliance irrespective of thickness.
(b) It must have minimum porosity.
(c) It must have maximum adherence.
(d) It must afford high protective value against corrosion.
(e) It must be uniform, dense and ductile.
(f) It should increase the throwing power of any chromium deposit subsequently applied.
(g) It should not be critical as to hydrogen absorption.
(h) It should be free from nickel hydrate in the crystal grid.

It can be readily assumed that any electrolyte and deposit even approximating the above requirements will not only represent a marked advance in the electroplating practice, but eventually prove of great value to the industry in general.

Ordinary Bright Solutions

There are today in commercial operation nickel baths producing bright plates. However, it is doubtful if any of these can even approach the requirements just outlined. Most of these bright baths consist of simply the usual nickel solutions containing sulphates, chlorides and boric acid in varying proportions, to which have been added rather small amounts of certain organic or inorganic compounds. Among the organics are various gums and colloids; cadmium and cobalt salts more or less cover the inorganic additions. These addition agents present in very small amounts, impart a very satisfactory brilliance to the nickel deposit but only when this deposit is quite thin. The addition agents are difficult to control quantitatively, and somewhat critical as to the brilliant range. They are also co-deposited with the nickel into the crystal grid, tending to enlarge it rather than to consolidate its structure. It is generally believed that these agents have a beneficial, inhibiting effect on the growth of the nickel crystal, but if that be so the indications are that they at the same time, by their presence in the plate, prevent a close packing together of the crystals. These agents, further, promote the co-deposition of nickel hydrate with disturbing effects in the physical properties of the deposit.

In fact, brilliant deposits can be easily obtained from the usual nickel baths even without the assistance of these additional agents, if the thickness is of no importance. Though the brilliant deposits may be slightly heavier in baths containing the above-mentioned addition agents, the plate is still too thin to be of value other than for a flash finish on cheap novelties. Furthermore, this type of bath can only be operated at rather low current densities with consequent increase in the plating period. Outdoor exposure tests conducted by the American Electro-Platers' Society and the A. S. T. M. have shown that no plated coating containing nickel of less than .001" thickness will satisfactorily protect a ferrous base under severe conditions of exposure. From this it becomes evident that thin nickel deposits could have little commercial value.

Dr. Max Schloetter, of Berlin, has found that in a series of tests that peeling of chromium deposits, applied over nickel plate, if not due to improper clean-

*From the Monthly Review of the American Electro-Platers' Society, November, 1934. A Paper read at the Convention of the A. E. S. in Detroit, June 11-14, 1934.

ing, is caused primarily by hydrogen being absorbed by the nickel plate during the chrome plating process and this hydrogen, when its quantity exceeds the maximum absorbing capacity of the nickel, diffuses to the base metal, creating a pressure between the nickel and the base sufficiently high to cause the deposit to blister and lift, in some cases immediately and in others only after standing for a considerable period. These tests have further shown that the hydrogen absorbing capacity of a nickel plate increases with its thickness, and it has thus been shown that a heavy undercoating of nickel is the best insurance against the vexing problem of peeled chrome plated work. A bright nickel process is, therefore, of only small commercial value if it does not maintain brilliance irrespective of deposit thickness.

There are other types of bright nickel baths prepared by the use of cyanides, citrates, formates, lactates in various combinations with inorganic salts of nickel, which show some promise, but which are, to my knowledge, not in commercial use due to their erratic behavior, instability and low operating efficiencies.

Since the particular bath which I am going to discuss in the following has been introduced to the industry, some electrolytes have appeared which produce brilliant deposits within the commercial thicknesses of metal deposits as specified for the finishing of parts by the automotive and other industries. I have found these baths unstable and erratic in operation, as the organics present decompose slowly in use, loading the solution with inert waste products which subsequently become included in the deposit with most undesirable effects on its properties. These disturbing effects are caused by the decomposition of the organic factor by electrolysis, reaction with the nickel salts in the bath itself, or the cathode metal.

A New High Gloss Solution

I am now coming to the discussion of the high gloss nickel bath which forms the subject of this paper. This bath is finding increasing use by the industry, and has been in satisfactory operation commercially over quite a long period, so that definite conclusions about its properties may now be reached. This bath contains metallo-organic salts of nickel in combination with some inorganic salts of this metal, which, however, function mainly as conducting agents.

This bath is stable and operates satisfactorily over a wide range of pH, running from 2 to 6, at temperatures from 85° to 130° F. Concentration may be varied within 10° Be. without affecting results. Brilliant plates may be obtained from this bath at current densities as high as 200 amps./sq. ft., and although it is questionable whether such high current densities would be used commercially, it is indicative of the great speed and flexibility of the bath, as far as this variable is concerned. Furthermore, the solution is entirely self-sustaining from the anode, the anodic efficiency being very high, so that only about one-half of the anode surface of that usually required for the old type baths is necessary. The latter fact, naturally, cuts anode investment in half.

The cathode efficiency at the lower current densities is approximately 99%, diminishing to approximately 95% at the higher current densities.

Heavy Deposits

This new type nickel bath produces brilliant deposits up to ⅛" in thickness and more, the brilliance tending to increase with increasing thickness of plate. It is not known as yet up to what thickness the plate may be deposited without affecting its brilliance or structure, ⅛" being the maximum so far attempted here. It is interesting to note that when applying these plates to somewhat rough metal surfaces, the physical imperfections present in the base appear to be minimized after a thickness of 1/1000" or more is obtained. With deposits as thick as ⅛" a mirror-like surface is obtained even on a somewhat rough base. As an explanation of this phenomenon it may be that a series of layers of very fine crystals are, in this process, superimposed on each other, rather than that the original base crystal is made to grow larger to produce the thickness of the plate.

It may be mentioned that these bright plates in thicknesses of approximately .0005" and above are not always as ductile as those obtained from some of the standard type inorganic baths. However, as the physical characteristics of the deposit are largely governed by the proper correlation of the bath operative factor, fairly ductile coatings can be obtained. Further study is required into the actual effect of the different factors on the bright nickel base on the ductility of the plate.

Properties of the Solution

The throwing power of a properly electrolyzed and aged solution is very high and entirely satisfactory for all commercial purposes. Due to the wide working range, control of the solution is simple, requiring only determination of pH from time to time and also concentration. The temperature range is wide, but the maximum limit must be carefully observed, as above this, lack of brilliance and fogging will result.

The bath is no more sensitive to contamination with copper, iron, zinc and lead than the usual nickel solutions. Copper, if present in excess, will cause fogging of the deposit, particularly at the lower current densities. Iron must be carefully watched, as its presence will cause pitting. Lead, if introduced into the solution through stray currents on a tank lining, will produce black streaks. However, the bath is readily adaptable to corrective and purification methods, no special or elaborate procedure than those ordinarily employed being necessary for this purpose.

I believe it is generally understood that all freshly prepared nickel baths must undergo a period of aging or working before satisfactory results are obtainable. With this new bath this period is considerably longer as evidently the constituents cannot be brought into proper combination and balance as rapidly as in the old type inorganic bath. At the beginning of commercial operations this was not understood so well, and led to some disappointments, but now means have been found to properly age the solution and bring it to optimum efficiency within a very short period after its preparation. It has also been found possible, recently, to convert old and well-aged baths of the ordinary type into this new type bath within a few days. This should not be confused with merely the introduction of an addition agent, as the conversion of an old bath into the high gloss type involves study and analysis of the old bath, if the conversion is to produce a stable and efficient electrolyte.

Properties of the Plate

The properties of the plate have already been described above. Its extreme brilliance is evidently due to the particularly fine structure of the crystal grid and to the fact that no nickel hydrates or other foreign bodies are occluded. Because of the close packing of

the crystals porosity is at a minimum, and density at a maximum.

The deposit has the peculiar property of increasing the throw of any chromium subsequently applied. This property was observed when the bath was first used commercially, leading to more definite data, determined and described in a paper by Korpiun & Vogel, from which I am going to take the liberty to summarize and quote:

"Several copper polished strips were nickel plated in the commonly used nickel baths, with a deposit weight of 50 g. per square meter. Immediately after rinsing, the strips were chromium plated. The throwing value of these tests has been compiled in the following table:

(1)	Unpolished deposits throwing power ..	9.5 cm.
(2)	Polished deposit	6.5 cm.
(3)	Bright nickel deposit	14.5 cm."

These show that the throwing capacity of the chromium bath is influenced in a very great measure by the type of nickel plate on which the chromium has been deposited. Particularly the fineness of the nickel deposit crystal seems to exercise a great influence on the throwing capacity, as evidenced by the fact that with increasing gloss, hence with increasing fineness of grain, the throwing capacity rises. It might now be deduced that polished deposits would also cause the throwing capacity of a chromium bath to be higher with less glossy or dull deposits. This, however, is not the case, because the fineness of the grain in the deposit is altered in no manner by the polishing process.

The throwing capacity of the chromium bath is, therefore, even considerably lower over polished nickel deposits than over unpolished ones. The cause of this behavior cannot be now definitely stated. It must be considered that the polishing operation process "blots out" the surface of the metal crystals lying on the outer side of the deposit or, more exactly, deforms these. Numerous tests have taught us that deformed crystals behave quite differently, physically and chemically, from normal, free-grown crystals.

Further tests have shown that the throwing capacity of all other chromium baths are influenced in the same manner as shown above for one particular bath. It has been shown above that unpolished, dull nickel deposits caused an increase in the throwing capacity of the chromium bath over the polished one, and the throwing capacity of the chromium baths over finely grained, highly glossy nickel deposits was always considerably higher than over ordinary dull deposits.

The results of the described tests may be summarized as follows:

1. Over polished nickel deposits the throwing capacity of chromium baths is worse than over dull, unpolished nickel.
2. Over high gloss and, therefore, finely grained nickel deposits, the throwing capacity of chromium baths compared with that over dull, coarsely crystalline deposits is improved; chromium is, therefore, then more easily deposited in the process of profiled articles.

The operation of the bright nickel solution and its proper maintenance does not require any more care and attention than that given the old type baths, with the exception, of course, that the temperature and concentration must be maintained within the proper limits which, as mentioned before, affects the brilliance and physical characteristics of the plate. It is also important to correlate the concentration of the electrolyte to the pH value and current densities, particularly when these are used at the higher values.

Practical Operations

The bath can be used in the ordinary plating tank, if this be rubber lined, plain wood, or lead lined. Tar or pitch tank linings are not satisfactory, as the solution is operated warm. No other than a 99% plus nickel anode can be used, with the exception of a lesser nickel content only if the balance is nickel oxide or carbone. The anodes must be bagged and the solution filtered periodically, particularly with agitated baths. If this is not carefully observed, rough deposits will result, produced by caraphoretic growths on the cathodes. This difficulty is augmented in these bright baths, due to the very rapid anodic corrosion. Still solution can be operated at C.D. up to 40 amps. per sq. ft., agitation being essential at higher ones.

The electrolyte is satisfactory for barrel plating, but due to the higher C.D. necessary, heavier leads and the best contacts possible are essential. The design of the barrel for this new bath deserves study.

As to cleaning, no departure need be made from the usual practice, except that reasonable care should be exercised, as in addition to preparing the base metal surfaces in the proper manner for good adherence of the nickel, any impurities or surface defects that might be present will cause localized dulling of the plate. With thick nickel deposits as obtained in the usual baths, anything affecting the crystal nucleus or structure would pass by unseen, as the deposit is sandy and dull. On the other hand, with a bright bath the effect of any such impurities or disturbances would not only affect the brilliance but the physical characteristics of the plate as well.

As the brilliance of the deposit depends largely on the base surface, it is obvious that this should be well prepared, as any imperfections or scratches will be visibly translated by the nickel when the deposit is less than 1/1000".

On sand-blasted and satin-finished base metal, rather interesting and attractive effects are obtained. The nickel on this particular type of surface, when in thickness of over .0005", has a peculiar depth and brilliance, and, furthermore, does not readily mark on handling, any smudges being easily wiped off.

Another interesting property of the deposit is its retention of brilliance for a considerable period. Of course, eventually the usual dulling will occur.

Reduction of Costs

The most valuable contribution to industry made by this development is not only the quality of the plate, but the fact that in most instances considerable economies are effected. For example, due to the possible use of high current densities, thick deposits may be obtained in minimum time, thereby reducing the volume of electrolyte, anodes, floor space, etc.

In addition, subsequent polishing of the nickel is eliminated, with obvious savings in the necessary labor and materials and power necessary for this operation. The nickel metal lost during the polishing, which I am informed runs to approximately 15% of the thickness, and considerably more at the edges, is saved. Due to the high operating efficiency of the bath, also high throwing power, deposit specifications can be more closely adhered to.

Some additional savings will accrue from the elimination of rewiring and recleaning before chromium plating, as the nickel parts can pass directly into the chromium bath with only an intermediate water rinse.

The Manufacture of Copper Tubes by Electro-Deposition

By TUBE MAKER

The Advantages of Electro-Deposition Over Mechanical Methods. Details of the Process

IT IS only in comparatively recent years that success has been attained in the manufacture of copper tubes by electrolytic means. Although in use for some time past, many of the products of electro-deposition were not suitable for the various commercial applications expected of them. As a result, progress in this line has been somewhat retarded although it is generally contended that the quality of the product is beyond reproach, and easily superior to the cast or extruded metal.

Condenser tubes, locomotive, boiler, and firebox tubes, have all been successfully made of recent years by the electrolytic system. So far, most of this work has been done in Europe, but it is now being taken up in earnest in England since the trading conditions have been altered.

Unlike the extrusion processes, the electrolytic method does not require a large outlay in plant, such as presses, dies, and hydraulic, or other systems of power transmission. Comparatively speaking, the electrolytic plant is very economcial, but there are numerous technical difficulties which have been responsible for the system not receiving wider application. These difficulties can almost invariably be attributed to one failing, namely that of not being thoroughly acquainted with the finer points of electro-deposition itself.

The actual deposition of the metal in tube form presents no difficulties. The section requiring most attention is confined to that of attending to the electrolyte.

Process Employed

Several different automatic contrivances are employed to ensure the deposition being accurate and furnishing a uniform tube.

One of the first systems employed consisted of depositing the copper from a specially prepared electrolyte onto rotating cylinders. Uniformity of the deposit was attained by rolling and polishing under pressure by means of agate rollers.

An improvement on this consisted of beating the deposited tube with little hammers. The latter were actuated by electro-magnets which depended on the conductivity of the deposited copper, and therefore any impurities present which impaired this quality, directly prevented the hammers from delivering their customary blow. In this way, a small section of the tube would first, contain impurities preventing the hammers working properly, and second, that part would not be beaten to uniformity, hence making the whole tube unfit to stand pressure work.

The method of rolling and polishing under pressure had much in its favor to commend it, but the initial cost of installing a suitable plant to ensure sound mechanical treatment, particularly when provided with agate rollers, was too great for the system to gain any wide commercial application.

At the outset, one of the troubles immediatelv noticeable is that certain sections of the tube are built up more readily and rapidly than others. In this way, the tube is thicker in parts and hence not uniform. To overcome this difficulty one inventor introduced a special arrangement.

This consisted of an automatic contrivance which covered the places where deposition took place too quickly, by means of an insulating layer. As a result, the tube deposited was uniform and possessed great tenacity.

A point which militated against this system, however, was the fact that tubes of large diameter, and particularly with sharp bends frequently burst when under high steam pressure.

The reason given is that the copper is deposited in a flaky condition, and in reality does not form a homogeneous mass, although not apparent to the eye. When high steam-pressure acts on a sharp bend in the tube this loose deposit tends to scale off.

The Electrolyte

The electrolyte almost invariably used for this work is acid copper sulphate; its resistance is affected by its temperature and composition. An increase in temperature decreases the resistance.

The electrolyte is heated by means of a storage tank which is heated by steam coils. It should be noted that there is a practical limit to the degree of heating as the steam cost may exceed the saving in current beyond a certain point; this depending upon local conditions.

The employment of too high a temperature can effect the character of the deposit. Evaporation is sometimes unduly increased, and also the humidity in the tank room makes the work unpleasant for the operators.

The resistance of the electrolyte is directly effected by the composition. In order to secure the best results and minimum resistance, it is necessary, to keep the free acid in the electrolyte as high as possible and the sulphates as low as possible. The practical limits to high acid and low sulphates are that there must be a sufficient amount of copper in the vicinity of the cathode so that only copper ions will be discharged.

One accepted maxim is that the lower the contained sulphates in the electrolyte, the higher can the acid be maintained.

The composition of the solution used is usually 4% copper sulphate and 10% sulphuric acid, or alternatively, 16% copper sulphate.

The anodes are approximately 1.5 to 2 inches apart from the cathodes. The temperature of the electrolyte should be maintained throughout at 50°C. (122° F). Current density is 46 amps per square foot, while the voltage required usually ranges from 12 to 14.

The circulation of the electrolyte is probably the only factor which is permitted to vary. The reason is that it usually reaches the electrolysis vat from a storage tank overhead, and hence the pressure varies. Best results are secured if the flow is not too rapid. It should be added that the voltage tends to vary at different periods of the deposition, as will be understood by practical operatives, since there are times when the alignment of anode and cathode are not maintained, although theoretically they should be the same throughout.

In some instances the mandrels (cathodes) are revolved from time to time, while in others they are kept in constant motion.

Various measures are used to ensure the finished tube being easily removed from the mandrel. A coating of lead is added to the steel mandrel so that by heating the lead will melt and thus permit the copper tube to slip off without difficulty.

In place of using rough cast tubes of copper as anodes, copper rings are employed in the form of circular grids which are hung by hooks, and in this way encircle the mandrels. The mandrels extend into recesses in wooden blocks. The plant is compact and extremely simple, and the work of deposition proceeds unhampered so long as the correct conditions are maintained.

Current Efficiency

Since the power cost rises much more rapidly than the current density, a point is soon reached where the power cost becomes exceedingly high, although increased current density requires the use of fewer tanks and less building space for a given output of tubes.

Current leakage is experienced even in the most up-to-date plants, and is usually found to vary with the voltage on each circuit; that is, the higher the voltage on any circuit, the greater will be the leakage.

When the leak occurs to the ground it is usually made evident by the copper deposited at the point where the current leaves the electrolyte. But, as a general rule, the greatest part of the loss is due to short circuits in the tanks. One of the worst troubles in this connection, is that of having the tubes and connections not properly aligned which directly results in short circuits, and unequal current distribution generally.

It is now pretty generally accepted that the best results are secured by working at not too high a temperature, at a pre-determined acid concentration, and fairly high current density, and the absence of dissolved oxygen or other oxidizing agent is beneficial.

Current leakages are determined by opening the circuit in the middle and taking ammeter readings when the voltage is normal, but as this applies the full voltage to only half the tanks, the indicated leakage tends to be somewhat higher than the actual amount.

Another method consists of comparing ammeter readings at several points in the circuit, care being taken to watch stray fields which may exist in the neighborhood of conductors carrying heavy current.

Depositing the Tubes

The "scaling off" difficulty which so long retarded progress in the depositing of sound copper tubes has now been overcome.

The chief factor which led to success was that of electrolyzing under high hydraulic pressure. The work is conducted in earthenware vats lined with sheet lead, and the copper is made to deposit in lead tubes of the requisite size, which are fitted with cores and rows of little holes. These act as the cathodes, while suitably made copper anodes supply copper to the sulphuric acid solution.

Should the concentration fall unduly, this is rectified by adding a small amount of copper sulphate crystals to the storage tank. The current density is maintained at almost double that employed in ordinary electrolytic copper refining, namely 46 amps. per square foot. The copper is deposited in tough and uniform condition, and in appearance resembles a felt like mass of interlacing hairs.

The strength of the tubes is usually tested by cutting wires from the tubes by means of a lathe or a special circular saw which cuts spirally. These wires are then put to the ordinary physical tests of tensile strength, elongation, ductility, etc., and directly represent the quality of the tube.

Bent tubes which are greatly used in locomotive construction, have specially made lead tubes and cores made to suit, but otherwise the process is the same.

British Standards for Electro-Plating

THE first two of a new series of British Standard Specifications for the electroplating industry have recently been published by the British Standards Institution. They are B. S. S. No. 558—1934. "Nickel Anodes for Electroplating," and B. S. S. No. 564—1934. "Nickel Ammonium Sulphate and Nickel Sulphate for Electroplating." These specifications (as well as those in course of preparation) have been prepared at the request of the British Electrodepositors' Technical Society, who, among other interested organizations, have assisted in their preparation.

In the electroplating industry the purity of materials employed is of the highest importance if good work is to be produced. It is well known that frequently plating jobs are spoiled through defects in the solution which defies all attempts of the practical plater to discover. In such cases the failure is usually attributed to the impurity of one or other of the chemicals used, or possibly to some excess of impurity in the anode.

The British Standard Specifications have been prepared to reduce to a minimum the possibilities of failure; they require that the material shall be up to a high standard of quality, and that any impurity must not be present in excess of the maximum specified.

Copies of these specifications (No. 558 and 564—1934) can be obtained from the Publications Department, British Standards Institution, 28 Victoria Street, London, S. W. 1, England, price 2s. 2d. each, post free.

—A. E.

Standard Trade Customs for the Non-Ferrous Foundry Industry

The "Code of Ethics" for the Miscellaneous Sand Castings Division Adopted by the Non-Ferrous Foundry Association at its First Annual Meeting in Chicago, Ill., September 19-21, 1934.

(1) Inquiries from Purchasers shall give actual or estimated rough weights of the castings.

(2) Inquiries from Purchasers shall give a detailed description of pattern and core box equipment to be furnished. This description should indicate whether the pattern and core box is plated, gated, single, skeleton or sweep, metal or wood. Before patterns are made, the Purchaser shall submit blue prints to the Member of the Industry, that is to make the casting, to obtain suggestions concerning the best method for constructing the pattern equipment.

When the Purchaser furnishes pattern equipment, skeleton patterns, core boxes, sweeps or conjunction patterns, contrary to the description already given, and which increase the cost of production, an extra charge shall be made to cover the increase in cost.

(3) Members of the Industry are not responsible for variations existing between blue prints and equipment supplied by the Purchaser. Any expense due to incorrectness of pattern and core box equipment shall be borne by the Purchaser.

(4) Patterns, core boxes, loose pieces thereof, core driers, core plates, etc., shall be properly marked for identification. Purchaser shall mark equipment for identification.

(5) All transportation charges, by reason of using a Common Carrier, on pattern equipment to and from the plant of a Member of the Industry shall be paid by the Purchaser.

(6) All packing and crating cost in excess of one dollar ($1.00) for transportation of patterns by reason of using a Common Carrier to and from the plant of a Member of the Industry shall be paid by the Purchaser.

(7) Insurance on patterns against fire and the elements shall be the responsibility of the Purchaser.

(8) Members of the Industry shall be responsible for loss or damage to pattern equipment only when due to careless handling or negligence on the part of such Members of the Industry, but not when due to fire or other causes beyond their control.

(9) Changes in orders shall be confirmed in writing by the Purchaser.

(10) No order should be changed unless notice of revision is made and accepted in writing before work is in process. If work is in process, Purchaser shall be charged for any castings made as well as cost of cores, molds or equipment discarded because of such changes.

(11) A Member of the Industry is responsible only to the extent of replacing castings rejected due to foundry defects, and such castings must be reported or returned to the maker within a reasonable time after shipment. Castings to replace rejected castings shall be shipped free of cost to the Purchaser.

The Member of the Industry is not responsible for labor charges, or damage caused by defective castings.

A Member of the Industry shall not be liable for consequential, special or contingent damages.

(12) Any labor charges incurred in the salvaging of defective castings, shall be mutually agreed upon in writing between Purchaser and Member of Industry.

(13) Full weight of castings rejected and/or replaced should be returned to Member of Industry. Crating and transportation charges to be paid by Member of Industry. Shortages in such weights shall be charged for at the current metal prices prevailing on date of order.

(14) Unless otherwise specified, castings are sold as unmachined castings with gates, heads, risers, fins and other projections removed to approximately the contour of the pattern.

(15) Where overtime or Sunday work is required an extra rate is paid and castings made during such overtime period shall carry a proportionate advance in price.

(16) Pattern storage facilities are provided by Members of the Industry for active patterns only. Patterns not in use for a reasonable period should be returned to the owner, or be subject to storage charges.

(17) Purchaser agrees to save Member of Industry harmless from loss or damage by reason of the manufacture and sale of any patented device, or parts thereof, made in accordance with drawings, designs, models or patterns furnished by the Purchaser.

(18) Member of the Industry will not be liable for any delay in the performance of orders or contracts or in the delivery of shipment of goods or for any damages suffered by Purchaser by reason of such delay, when such delay, is directly or indirectly caused by or in any manner arises from fires, floods, accidents, riots, war, government interference or embargoes, strikes, shortage of labor, fuel, materials or supplies, inadequate transportation facilities or any other cause or causes (whether or not similar in nature to any of those hereinafter specified) beyond its control.

(19) Taxes: Federal, State or Municipal Taxes now or hereafter imposed in respect to all sales and/or the production, treatment, manufacture, sale, delivery, transportation or proceeds of the products specified against such sales (except income taxes) will be for account of Purchaser, and if paid or required to be paid by Member of Industry the amount thereof will be added to and become a part of the price payable by Purchaser.

(20) Terms of payment shall be net thirty (30) days from date. A discount of not more than one percent (1%) may be allowed for semi-monthly settlements.

EDITORIALS

Nonferrous Metal Progress

IN this day of economic surveys, economic histories, economic forecasts, and so on **ad nauseam** we were recently surprised and pleased to read an article on economics written not by an armchair economist, but by an expert in the field of which he wrote. His words had the ring of intimate knowledge, of personal experience rather than abstract theory, and they engendered confidence in their reliability.

The review of which we speak so highly was presented by Dr. Zay Jeffries at one of the sessions of the recently held National Metals Week. Dr. Jeffries traced the history of non-ferrous metals, comparing them with pig iron for the past fifty years. In 1885, pig iron production totalled about twenty times the tonnage of non-ferrous metals; in the period from 1930-1934 it was only fourteen times as great. (The production of new metals is of course, affected by the recovery of secondary metals which has been growing both in quantity and in proportion to the total, and on the whole, there is a greater relative recovery of non-ferrous than of ferrous metals). While the production of pig iron during the last twenty years has been declining in its rate of increase, the trend in the production of non-ferrous metals has continued at approximately the same rate; hence the increasing proportion noted above. Restricting ourselves to the question of tonnage, therefore, it would seem that non-ferrous metals are more "depression-proof" than iron and steel. This, however, leaves out the element of price which immediately eliminates most of the non-ferrous metals from the depression-proof class.

Copper, lead and zinc comprise almost 90 per cent of the total tonnage of non-ferrous metals produced in the United States. In value, however, the picture is changed. In 1929, world pig iron production was worth about $2,000,000,000; world gold production, about $400,000,000. In 1934 pig iron produced was worth about $900,000,000, and the gold (at its new price) about the same. Consequently, the total value of the new non-ferrous metal production is considerably greater than that of pig iron.

Dr. Jeffries sees small danger of a shortage of non-ferrous metals. If such a time should come due to the fact that the earth's crust contains such infinitesimal percentages of copper (0.01%), zinc (0.004%) and lead (0.002%), the exhaustion of these ores will come gradually. We will be forewarned in good time by rising prices and be able to change our industrial habits to conform with these changes. "We can safely transfer this burden to the shoulders of the coming generations." It is possible that iron and aluminum, which comprise about 5 and 8 per cent respectively of the earth's crust, may eventually share the throne together as the world's largest tonnage metals, but in that event there is no cause for present alarm.

For the near future, the problem is quite the reverse. We need increased consumption of metals which can come only through increased business activity. Perhaps this will result from the industrialization of the backward countries, raising their standards of living, and consequently their demand for metals. If the rest of the world consumed as much metal per capita as Western Europe and North America the total world consumption would be multiplied by five. It can also be said safely that even the more industrially advanced peoples have not reached their peak in metal consumption.

The leading metals of the distant future cannot be named today with any degree of certainty. We know there will be metallurgical problems for the future to settle, but we may feel reasonably assured that none of these problems will be insoluble.

Today's Business

WE have been heartened somewhat lately by the improved tone in the reports about business and industry. The most recent report of the National Industrial Conference Board states "Business improved a little more than seasonally in October." The most noticeable change was the upturn in residential construction, which totalled over $26,000,000 in October, a sharp gain over both the preceding month and October, 1933. Publicly financed construction awards also rose, from $69,000,000 to $78,500,000; but more important was the fact that in October they constituted only 58 per cent of total construction awards, whereas in the preceding month they had totalled 63 per cent.

The cost of living showed the first decline since April of this year, registering 80.9 in October compared to 81 in September, using 1923 as the base, 100.

There are other voices in the air. In spite of the continued heavy outlays by the Government the pressure for a balanced budget is becoming greater. An interesting and thoughtful plan was presented by the National Economy League, in very round figures to be sure, but still worthy of very serious consideration. The plan proposed a Federal budget for the fiscal year beginning July 1, 1935, of $5,435,000,000 to cover all expenditures, emergency as well as ordinary, exclusive of the sinking fund.

An interesting innovation which may result in some expansion of industry was an offer by the Reconstruction Finance Corporation to lend money directly to solvent industrial concerns established prior to January 1st, 1934, in sums up to $500,000 for periods as long as five years. Perhaps the smaller companies who have been unable to secure accommodations at banks will be enabled to finance themselves in this fashion.

The index of business continues to rise slowly but steadily. According to the New York Times Weekly Business Index, the figure for the week ending November 24 was 76.8 against 76.5 for the previous week, 73.9 for the same week of last year, and a recent low of about 72 in the middle of September.

The air is still murky but it may be clearing.

Research Continues

WE have so many times in these columns counseled the steady prosecution of research that there is hardly any need to repeat such injunctions. We prefer in this instance simply to state some facts—a list of the researches and testing programs under way by the American Society for Testing Materials:

Atmospheric corrosion tests of galvanized (zinc coated) sheets.

Atmospheric corrosion tests on metallic coated hardware, structural shapes, tubular goods, etc.

Corrosion tests on electroplated coatings.

Atmospheric corrosion of non-ferrous metals and alloys.

Corrosion of non-ferrous metals and alloys in liquids.

Galvanic and electrolytic corrosion of non-ferrous metals and alloys.

Relative life of various screen wire cloths.

Properties of die steels (for die casting) at elevated temperatures.

Fatigue of metals.

General study of properties of babbitt metal.

Properties of copper-base alloys in ingot form.

Investigation of aluminum and zinc-base die-casting alloys.

X-ray metallography.

The list speaks for itself. It proves that metal progress is going on, rain or shine.

Rebuilt Versus Second Hand

IN times like these, there is a growing tendency, naturally enough, to purchase used equipment for expansion and replacement rather than new machinery, because of the saving in cost. This practice can, if carefully managed, effect attractive savings for the purchaser. It can also lead him into serious trouble. A recent communication from a firm of machinery builders, points out clearly some of the dangers involved.

In the first place the machinery must not be too long out of date and the design must be good. In the second place, it is important to differentiate between the various grades of used equipment.

There are three classifications of such machinery: (1) second-hand, (2) reconditioned and (3) rebuilt. Second-hand is equipment "as is, where is, and no questions asked or answered." Reconditioned means checked, cleaned up and perhaps refinished. Rebuilt should mean completely torn down, defective parts replaced or repaired and re-assembled. It should also include a guarantee.

To be safe in buying used machinery, the buyer must understand thoroughly the machines he intends to take or he must have the guidance of a reliable specialist. It is in order also to repeat that he should have a guarantee, specific in its terms.

Incidentally, one of the best precautions to take is to deal with a reliable house.

Silver, Silver, Who Gets the Silver?

TO guess what is in anyone's mind is always difficult. To guess what is in the minds of the Government has been given up by most of us as a bad job. For that reason, we read with something approaching awe, a report from the Washington correspondent of a metal paper on the silver situation.

The prediction of the advocates of free silver that China's prosperity would be enhanced, has as generally expected, come to naught. An official note from the Chinese Government pointing to her distress caused by the decrease in the amount of silver which she is able to obtain for her exports is proof positive. It seems, however, that the United States Government wishes to push up the world price of silver, after buying huge quantities, to the point where a book profit of over $2,000,000,000 will be realized on the revaluation at $1.29 an ounce for coinage purposes. In the meantime, however, China has placed an export duty on silver, partly to conserve her metal and partly to realize some of the profit. This move has operated to raise world prices sooner than expected, thus forcing the Treasury to pay higher prices and consequently to realize smaller profits. Also it brings to the attention of the silver industry what the Treasury is planning to do and that it is still adhering to its plan.

As stated above, we solemnly abjure any intention of attempting to fathom the minds of the Government. To us the silver policy has been a mystery. So far it has resulted in prosperity for a very small group at the expense of much larger groups. Perhaps there are larger issues in the background. We hope for the best.

Gold Plated Prosperity

A GOOD joke will cheer us up even when we are feeling at our worst. What we have to relate is not a joke but it has its lighter aspects.

According to a communication from a job plating company in New York, gold plated bath-room fixtures are returning to popularity on the Long Island estates of rich New Yorkers. This type of "home modernization" is pointed to as an omen of economic recovery. If the ultra-rich are willing to spend from $500 to $1,000 for a bath-room, confidence must be returning, especially when such homes may have from ten to twenty baths.

Possibly so. We would be the last to discourage the optimist at any time. We cannot help feeling, however, that it might be a better index of recovery if the middle classes were replating their bath-rooms instead of making them last, and if the employment of labor were consistently on the rise.

In the meantime, our compliments to the job plater who gets gold plating bath-room contracts!

New Book

Platers' Guidebook. Fourth Edition—1934-1935, by Oliver J. Sizelove, Associate Editor of **Metal Industry.** Published by The Metal Industry Publishing Company, 116 John Street, New York. Size 5 x 8; 48 pages. Price 10 cents; free to subscribers of **Metal Industry** and **Platers' Guide.**

This is the fourth (revised solutions) edition of a booklet originally published in 1930. In its first three editions 38,000 copies have been distributed. It is put up as a handy pocket reference book for the plater, foreman, superintendent and chemist, for use in the plant in such form that it can be carried about conveniently. Its material is essentially practical in character, but it also includes a considerable amount of information on the technical aspects of plating operations, such as solution control by analysis, etc.

The best description of this booklet is a summary of the table of contents: Polishing Metals; Metal Cleaning; Solution Formulae for Nickel, Copper, Brass, Bronze, Zinc, Tin, Chromium, Cadmium, Lead, Iron, Silver and Gold; Metal Coloring; Analyses of Plating Solutions; Determining the pH of Nickel Solutions; List of Chemicals with their Common Names and Physical Properties used in the Electroplating and Metal Finishing Industry.

It is clear from the above list that the new edition will be considerably broader in scope than the one which preceded it. It is asked that requests for copies be sent on the stationery or letter-head of the firm.

Technical Publications

The Deposition of Zin Cadmium Alloys from Alkaline Cyanide Solutions. By Leslie Wright and J. Riley. Paper read before the Electrodepositors' Technical Society at the Northampton Polytechnic Institute, Clerkenwell, London, E.C.1, on Wednesday, 17th October, 1934.

Zinc and cadmium are capable of simultaneous deposition from solutions of their double potassium cyanides containing excess potassium cyanide, potassium hydroxide and an addition agent. They can be deposited together over a wide range of composition, and possess a color intermediate between that of cadmium and zinc. High cadmium content alloys 70-80% have a color little removed from that of cadmium, and the color only approaches that of zinc when the cadmium content reaches 2%.

The cadmium tends to plate out of solution, and will plate out almost to zero content, even when the anode surface is half cadmium and half zinc.

This tendency is not so marked if alloy anodes are used, but even in such solutions replenishment of the solution could be made only by additions of cadmium salts.

A marked increase in the cadmium content of the deposit was associated with increase in temperature, and cyanide content, but for an increase in current density the effect was less marked. Finally, it can be said that alloy deposits corresponding to, approximately, the composition of the solution can be deposited, and that they possess a smooth close-grained structure, but that the cadmium content can only be kept constant by maintaining the zinc cadmium ratio in the solution by additions of cadmium.

For purposes of ease of control the solution should be operated at room temperature, and only sufficient cyanide used to ensure adequate anode corrosion. The caustic alkali content should be maintained at a minimum. In all cases the deposits were perfectly adherent to the basis metal.

Coloring Copper, Brass and Bronze. Published by the Copper and Brass Research Association, 25 Broadway, New York.

A description of the rapid development of Patina on copper by the Cabra spray process, giving the preparation of the surface, the materials required, the preparation of the solution and the method of application.

The bulletin also gives methods of obtaining the following finishes: Brown, Reddish Bronze and Blue Tones on Copper or Alloys Containing 85% or Over of Copper; Verde Antique Finish on Copper or Brass; Antique Green Oxidized Effect; Hardware Green Finish On Brass; Pickling and Dipping Solution.

Zinc Die Casting Alloy Aging Data. By E. A. Anderson and G. L. Werley. New Jersey Zinc Company, Palmerton, Pa. Metals and Alloys, May 1934. Conclusions:

1. That rapid aging changes occur in all of the modern zinc die casting alloys which result in a small shrinkage and an increase in ductility.

2. That indoor aging tests at room temperature must be supplemented by elevated temperature tests when the data are to apply to service at temperature above room temperature.

3. That steam test data must be corrected for effects due to the temperature of the test if the true effects of corrosion are to be determined.

Research Points a Way to Improve Method of Chrome-Plating, by Joseph Geschelin, Automotive Industries, August 4, 1934. (Procedure for zinc alloy die castings developed from outdoor exposure work.

Recent Developments in the Electrodeposition of Nickel, by A. W. Hothersall. Published by the Bureau of Information on Nickel of the Mond Nickel Company Ltd., Thames House, Millbank, London, S.W.1, England.

The Anode Process. One of the Newest Developments in Rubber Technology. by Raymond W. Albright, general manager American Anode, Inc., Akron, Ohio. A description of the development of a process for electro-depositing rubber latex on various types of bases.

Gas Welding of Aluminum Tank Structures, by G. O. Hoglund, Aluminum Company of America, New Kensington, Pa. A paper read at the 35th annual convention of the International Acetylene Association, Pittsburgh, Pa., November 14, 15 and 16.

The Beneficial Use of Tin Compounds in Lubricants, by Dr. E. W. J. Mardles. Published by the International Tin Research and Development Council, 149 Broadway, New York.

The Running Quality of Aluminum. The October issue of the Journal of Research of the National Bureau of Standards, Washington, D. C.

Fineness of Molding Sand. Technical News Bulletin, October 1934, of the National Bureau of Standards, Washington, D. C.

Material Specification D. T. D. 240 for Heat Treated Silicon-Aluminum Alloy Castings; covering the alloy generally known as Alpax Beta. British Air Ministry, London, England.

Effect of Cold Rolling on the Indentation Hardness of Copper. Journal of Research of the National Bureau of Standards, Washington, D. C., November, 1934.

Gold-Chromium Resistance Alloys. Journal of Research of the National Bureau of Standards, Washington, D. C., November, 1934.

Means and Methods of Lessening Dust Exposure; taken from a report of the Special Industrial Disease Commission of the Commonwealth of Massachusetts. Northern Blower Company, Cleveland, Ohio.

Government Publications

United States Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, apply to governmental body responsible for publication.

Proposed Federal Specifications for Pins, Cotter. Split; (including brass pins). Federal Specifications Board, Washington, D. C.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical Electroplating, Polishing, and Metal Finishing

H. M. ST. JOHN W. J. PETTIS O. J. SIZELOVE
W. J. REARDON W. B. FRANCIS WALTER FRAINE

Black Cadmium Deposit

Q.—Under separate cover we are mailing a sample of our cadmium solution as used in our cadmium plating process. We have been experiencing difficulty in the fact that articles plated come out of the solution black. Upon wire brushing these, they come up to a bright polish. We would like to to have this solution analyzed to see if there is something lacking so that the article coming out of the tank will be bright instead of black.

A.—Analysis of cadmium solution:

Metallic cadmium	3.92 ozs.
Free cyanide	2.09 ozs.

The free cyanide content is too low and should be increased by adding 6 to 8 ozs. of sodium cyanide to each gallon of solution.

From the description you have given of the color of the deposit, we are of the opinion that an excess of brightening agent has been used. If so, the only way to remove same is to operate the solution at a high current density until the brightening agent has been removed. Add the recommended amount of sodium cyanide to the solution before operating at a high current density. —O. J. S., Problem 5,339.

Casting and Coloring Red Brass

Q.—I want to cast a basin out of red brass and give it the green color familiar to weathered copper. Can you give me the best composition of brass to use in making the casting and also tell me how to give it the proper acid treatment for a green finish?

A.—(1) One of the best compositions for this work is composed of

Copper	90
Tin	6
Zinc	3
Lead	1

Use only virgin metal. This alloy possesses the proper stiffness and color and casts remarkably well; runs freely and thin. The small amount of lead is sufficient to make the metal cast freely but not enough to affect the dipping of the casting.

The tin is sufficient to render metal free running and to give the proper hardness; at the same time it is not sufficient to cause much trouble from sand burning. The 3% zinc is enough to render the alloy sound but does not cause any spelter smoke to produce bad spots. It melts at a sufficiently low temperature to prevent casting chilling before it has run up full.

Only the best metal should be used. Melt the copper under

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date.....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.:.....**Cathode surface, sq. ft:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:**.....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary. _____

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY. 116 John Street, New York City.

charcoal and throw in a handful or two of common salt when melting begins, and stir it in. Then add the zinc and lastly, the tin and lead.

This is a good metal and is said to be used by one of the largest makers of statuary art goods, etc., in the United States.

W. J. R.

A.—(2) Formula for Verde finish:

Copper acetate	8 ozs.
Ammonium chloride	4 ozs.
Acetic acid	4 ozs.
Chromic acid	1 oz.
Water	1 gal.

This solution is brushed lightly upon the work and then left to dry for 10 or 12 hours. If the finish is not even or heavy enough, repeat brushing operation.

—O. J. S., Problem 5,340

Faulty Nickel Solution

Q.—We are sending under separate cover a bottle of our nickel solution. We would appreciate it very much if you would send us a report of this analysis at your earliest convenience.

A.—Analysis of nickel solution:

Metallic nickel	3.70 ozs.
Chlorides	1.85 ozs.
pH	5.4

The chloride content is a little low and the pH is entirely too low.

We would suggest that you add 15 lbs. of sodium chloride (common salt) and 40 ozs. of 26° ammonia to the solution.

—O. J. S., Problem 5,341.

Silver on Pewter

Q.—I have been silver plating small pieces of jewelry satisfactorily but cannot plate pewterware such as pitchers and trays. The generator that I am using now is very small.

I would like to know how to prepare such work for plating and how much current is necessary. Is it necessary to dip the pewter in a mercury dip and silver strike solution? Would copper plating help the silver stay on?

A.—In refinishing pewter ware, the old silver should be removed by stripping in a cyanide solution, 8 ozs. of sodium cyanide to one gallon of water, using steel cathodes and 5 or 6 volts.

After the silver is completely removed, pickle in hot muriatic acid, one part acid and one part water, for a few seconds and then scratch brush while wet, dry and polish.

The work is now ready for cleaning and a mild alkaline cleaning solution is used. It is then dipped in the cyanide dip, 6 ozs. of sodium cyanide to one gallon of water, and placed in a special silver strike solution. This special strike solution should be made by using 10 ozs. of sodium cyanide and ⅛ oz. of silver cyanide to one gallon of water.

From the special silver strike the work is transferred to the regular silver strike which should contain 6 ozs. of sodium cyanide, ½ oz. of silver cyanide and one gallon of water, and then plated in the silver solution until the desired amount of silver is deposited.

—O. J. S., Problem 5,342.

Silver Plating Reflectors

Q.—Have been nickel plating auto reflectors but now I want to silver plate them. I am using the silver strike and silver solution No. 1 from **Platers' Guidebook**. My method is as follows after cleaning:

Nickel plate for 5 minutes; silver strike for 15 seconds; silver plate 5 minutes; wet scratch brush; reclean; bright dip; silver strike and then silver plate for 15 minutes; wet scratch brush and then dry reflectors in sawdust. Polish with lamp black and oil on a canton flannel wheel. My reflectors are full of scratches.

A.—Your trouble in not being able to produce a satisfactory finish on the silver reflectors is due to the procedure you are using after plating.

After cleaning, plate for 5 minutes in the nickel solution, rinse in clean cold water and place in silver strike for 15 to 30 seconds, and then silver plate for 5 minutes.

After silver plating, rinse in clean cold water then, hot water and dry. If sawdust is used in drying, a fine grade should be used so that it will leave no scratches on the work.

For coloring the silver use a soft muslin or a canton flannel wheel and a silver coloring rouge which may be moistened with kerosene if necessary. The speed of the wheel should be 3000 to 3600 R.P.M. for coloring this class of work.

—O. J. S., Problem 5,343.

Silver Solutions

Q.—I am shipping by parcel post 3 bottles of solution for analysis. There is nothing exceptionally wrong, but wish to know if I am taking care of them as I should. When I plate with the silver solution I have to agitate the work or solution to keep the voltage constant or the voltage will climb to 6 volts.

Please let me know if it is the solution or the rheostat doing it.

A.—Analysis of nickel solution:

Metallic nickel	2.63 ozs.
Chlorides	.85 oz.
pH	6.2

Add to each gallon of solution 1½ oz. of sodium chloride and 0.6 cc. of sulfuric acid.

Analysis of cyanide copper solution:

Metallic copper	3.23 ozs.
Free cyanide	.66 oz.

Add 0.4 oz. of sodium cyanide to each gallon of solution.

Analysis of silver solution:

Metallic silver	2.16 ozs.
Free cyanide	2.53 ozs.

Add 2 ozs. of sodium cyanide to each gallon of solution. After you have made the addition of the cyanide to the silver solution and you have trouble maintaining constant current density, the trouble will be found in the rheostat.

—O. J. S., Problem 5,344.

Ten Karat Gold Solution

Q.—We are desirous of getting formula for a 10 K gold plating solution to be used on articles that will come in close contact with the skin. In giving us this formula we wish that you would keep in mind that an over abundance of copper or cadmium might cause the gold plating to tarnish and discolor whatever it comes in contact with.

We are in need of this formula because the articles to be made will be in Sterling silver and with certain persons one day's wear will cause a black spot to show.

A.—Karat gold solutions are best prepared by the porous pot method. With this method a gold anode of the desired karat is used in a cyanide solution with the porous pot until enough gold is dissolved from the anode and enters the solution.

The crock that is to hold the gold solution is connected the same as for plating with the anode attached to the positive rod. Four ounces of either sodium or potassium cyanide is dissolved in each gallon of water that the crock contains.

The porous pot is supported on the negative rod with an insulated wire. The porous pot also contains a cyanide solution of 4 ozs. to 1 gallon of water and a copper or steel cathode is placed in the pot. Six volts are used to reduce the anode until the desired quantity of gold is put into solution. This can be determined by weighing the gold anode at different intervals of time.

Where the desired amount of gold (which should be from 4 to 10 dwt.) is dissolved from the anode, remove the porous pot and then determine by experimenting which is the proper voltage and temperature to use to produce the shade of color desired.

When gold plating sterling silver the deposit must be quite heavy to prevent tarnishing. A few minutes deposit of nickel upon the silver before gold plating will help prevent the tarnishing.

—O. J. S., Problem 5,345.

Patents

A Review of Current United States Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,966,260. July 10, 1934. **Copper Alloy Welding Rod and Method of Using the Same.** Elmer L. Munson, Naugatuck, Conn., assignor to The American Brass Company, Waterbury, Conn.

1,966,371. July 10, 1034. **Process for the Preparation of Pure Beryllium Compounds.** Walter Zisch, Frankfort-on-the-Main, and Gustav Jaeger, Neu-Isenburg, Germany, Luise Zisch, administratrix of said Walter Zisch, deceased, assignors to Deutsche Gold- und Silber-Scheideanstalt vormals Roessler, Frankfort-on-the-Main, Germany, a corporation.

1,966,496. July 17, 1934. **Method of Treating Metals.** Hal F. Fruth, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

1,966,596. July 17, 1934. **Metal Casting Apparatus.** William H. Peirce, Baltimore, Md., assignor to American Smelting and Refining Company, New York.

1,966,615. July 17, 1934. **Metal Casting Process.** Johannes Croning, Hamburg, Germany.

1,966,627. July 17, 1934. **Distillation Apparatus for the Production of Zinc or Similar Volatilizable Metals.** Friedrich, Johannsen and Arthur Leysner, Magdeburg, Germany, assignors to the firm Fried. Krupp Grusonwerk Aktiengesellschaft, Magdeburg-Buckau, Germany.

1,966,711. July 17, 1934. **Prevention of Corrosion.** Melvin De Groote and Wilbur C. Adams, St. Louis, and Kenneth R. Farr, Webster Groves, Mo., assignors to Tretolite Company, Webster Groves, Mo.

1,966,877. July 17, 1934. **Collapsible Tube Forming and Threading Machine.** Paul Witte, New Milford, N. J., assignor to White Metal Manufacturing Company, Hoboken, N. J.

1,966,941. July 17, 1934. **Molding Machine.** George F. Yager and Oliver J. Heath, Toledo, Ohio, assignors to The Bunting Brass and Bronze Company, Toledo, Ohio, a corporation of Ohio.

1,966,953. July 17, 1934. **Extrusion Press.** Alfred Liebergeld, Nuremberg, Germany, assignor, by mesne assignments, to Tubus A. G. Zurich, Switzerland.

1,966,955. July 17, 1934. **Method for Straightening Metallic Structural Members.** Donald K. Crampton, Marion, Conn., assignor to The Chase Companies, Incorporated, Waterbury, Conn.

1,967,053. July 17, 1934. **Method of Refining Lead Bismuth Alloy.** John James Fingland, Alexander Douglas Turnbull, and Peter Findlay McIntyre, Trail, British Columbia, Canada, assignors to The Consolidated Mining and Smelting Company of Canada, Limited, Montreal, Quebec, Canada.

1,967,120. July 17, 1934. **Burnishing Machine.** Frederick C. Good, Philadelphia, Pa.

1,967,153. July 17, 1934. **Machine for Trimming Tubular Metal Articles.** Miller A. McCreary, Danville, Ill., assignor to The Hegeler Zinc Company, Danville, Ill.

1,967,295. July 24, 1934. **Finishes for Surfaces.** Cornelius S. Dippel, Woodcliff, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y.

1,967,393. July 24, 1934. **Detergent Composition.** William S. Calcott, Penns Grove, N. J., and George Henry Cheney, Newport, Del., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del.

1,967,394. July 24, 1934. **Detergent Composition.** William S. Calcott, Penns Grove, N. J., and George Henry Cheney, Newport, Del., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del.

1,967,520. July 24, 1934. **Furnace for Heating Metal Wire.** Masanobu Tomura, Aayama, Akasaka Ku, Tokyo, Japan.

1,967,715. July 24, 1934. **Surface Treatment for Zinc Base Alloys.** Willett C. Magruder, Jr., St. Louis, Mo., assignor to Carter Carburetor Corporation, St. Louis, Mo.

1,967,716. July 24, 1934. **Method of Chromium Plating.** Henry Mahlstedt, Waterbury, Conn., assignor to United Chromium, Incorporated, New York, N. Y.

1,967,754. July 24, 1934. **Method of Preparing Laminated Metal.** Stephen L. Ingersoll, Chicago, Ill., assignor to Ingersoll Steel and Disc Co., Chicago, Ill.

1,967,789. July 24, 1934. **Chromium Plating Bath and Method of Making Same.** Erwin Sohn, Louisville, Ky., and Edward D. Meanor, Sewickley, Pa., assignors to Standard Sanitary Mfg. Co., Louisville, Ky.

1,967,796. July 24, 1934. **Casting or Molding Machine.** Paul Weiss, Nuremberg, Germany, assignor to Galex Die Casting Limited, Halesowen, near Birmingham, England.

1,967,810. July 24, 1934. **Deoxidation of Nonferrous Metals.** Willi Claus, Berlin-Steglitz, Germany, assignor to Ernst Brandus.

1,968,069. July 31, 1934. **Method of Making Clad Metals.** Arthur F. B. Chandler, Irvington, N. J., assignor to Westinghouse Lamp Company, a corporation of Pennsylvania.

1,968,329. July 31, 1934. **Metal Spraying Apparatus.** Donald D. Taylor, Duncannon, Pa., assignor to Advance Engineering Corporation, Duncannon, Pa.

1,968,344. July 31, 1934. **Malleable Aluminum Alloy.** Karl Leo Meissner, Duren, Germany, assignor of one-half to the firm Durener Metallwerke Aktiengelsellschaft, Duren, Germany, a joint-stock company of Germany.

1,968,370. July 31, 1934. **Method of Etching a Metal Graining Plate.** James A. Burns, Jamestown, N. Y.

1,968,440. July 31, 1934. **Lacquer and Method of Preparing the Same.** Ernst Elbel and Fritz Seebach, Erkner, near Berlin, Germany, assignors to Bakelite Gesselschaft mit beschrankter Haftung, Berlin, Germany.

1,968,441. July 31, 1934. **Process of Preparing Lacquers, Varnishes, or the Like.** Ernst Elbel and Fritz Seebach, Erkner, near Berlin, Germany, assignors to Bakelite Gesselschaft mit beschrankter Haftung, Berlin, Germany.

1,968,454. July 31, 1934. **Tube Compressor.** Frank S. Hyatt, Brooklyn, N. Y., assignor to Brass Goods, M'f'g. Co., Brooklyn, N. Y.

1,968,483 July 31, 1934. **Plating Aluminum and Its Alloys.** Johannes Fischer, Berlin-Charlottenburg, Germany, assignor to Siemens & Halske, Aktiengesellschaft, Siemensstadt, near Berlin, Germany.

1,968,490. July 31, 1934. **Method of Making Pulverulent Chromium.** Leo D. Jensen, Chicago, Ill.

1,968,645. July 31, 1934. **Bending Device for Metallic Tubes and the Like.** Albert Hossfeld, Winona, Minn.

1,968,670. July 31, 1934. **Method of and Apparatus for Rolling Rods.** Willard R. Carroll, New Haven, Conn., assignor to Farrel-Birmingham Company, Inc., Ansonia, Conn.

1,968,687. July 31, 1934. **Process of and Apparatus for Coating Wire.** Charles D. Johnson, Worcester, Mass., assignor to Johnson Steel & Wire Company, Inc., Worcester, Mass.

1,968,752. July 31, 1934. **Detergent Composition.** George S. Evans, Bronxville, N. Y., assignor to The Mathieson Alkali Works, Inc., New York, N. Y.

1,968,753. July 31, 1934. **Solid Detergent.** George S. Evans, Bronxville, N. Y., assignor to The Mathieson Alkali Works, Inc., New York, N. Y.

1,968,841. Aug. 7, 1934. **Flux for Silver-Soldering Stainless Steel.** Anthony J. Maffia, Brooklyn, N. Y.

1,968,922. Aug. 7, 1934. **Process of Coating.** Robert T. Wood, Cleveland, Ohio, assignor, by mesne assignments, to Magnesium Development Corporation.

1,968,958. Aug. 7, 1934. **Process for Preparing Sand Molds.** Edward Player, Gibbet Hill, Kenilworth, England, assignor, by mesne assignments, to Magnesium Development Corporation, a corporation of Delaware.

1,968,984. Aug. 7, 1934. **Method and Flux for Autogenously Welding Magnesium and Its Alloys.** William O. Binder, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

1,969,018. Aug. 7, 1934. **Alloy.** Robert H. Leach, Fairfield, Conn., assignor to Handy & Harman, New York.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

New Column Squeezer

A new type of column squeezer, particularly applicable to brass foundries, is being made by the Tabor Manufacturing Company, 6225 Tacony Street, Philadelphia, Pa. The machine has a 10-inch squeezing cylinder and a three-inch jar cylinder. The table is 18″ x 18″ and the jarring capacity 250 pounds. The maximum size flask recommended is 12″ x 24″. The maximum distance between the squeezing head and the table is 17½″. The table is 30″ from the floor.

The machine is furnished complete with vibrator, pressure gauge and blow valve, pattern rack, riddle rack and mold shelf. The squeeze operation is controlled by the Tabor pop throttle valve, which has been standard equipment for years on Tabor machines. The jar and vibrator actions are both controlled by knee operated valves. The squeeze head is provided with adjustment to accommodate the various depths of flasks and this head is mounted on roller bearings making it easy to operate.

The wheel base design is one of the distinguishing features of this machine, according to the manufacturers, as it makes the machine really portable.

New Tabor Column Squeezer

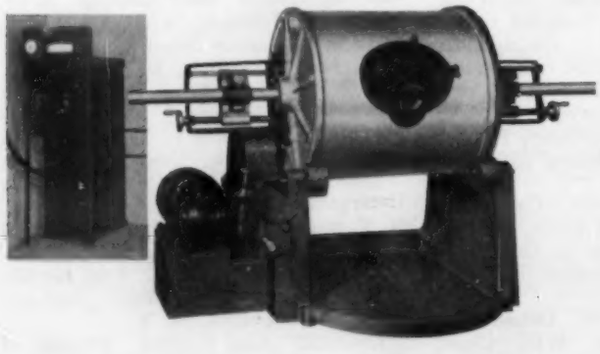
Automatic Rocking Electric Furnace

An electric melting furnace with automatic rocking device has been announced by Detroit Electric Furnace Company of Detroit. This new unit, designated Type GM, has been engineered to increase the angle of rock of the furnace shell automatically. The rate of increase may be changed—one rate being available for ferrous and another rate for non-ferrous materials.

A feature of the rocking mechanism is that the shell velocity is zero at the point of reversal—despite the constant speed motor. This innovation, it is stated, makes for a quiet, smooth running machine. The shell is positively timed by a gear to the reversing mechanism.

Water-cooled electrode clamps are used to insure a long life for these units. A special high temperature refractory is used and with interchangeable shells.

The unit is rated as 35 pounds cold charge and 80 pounds molten capacity. The manufacturers especially recommend it for experimental and test runs where temperature and compositional control are important factors.



New Detroit Rocking Furnace, Type GM

Belke Distributes Zialite

The **Belke Manufacturing Company,** 947 N. Cicero Avenue, Chicago, Ill., has been given the exclusive distributorship of Zialite in all the territory in the United States west of Buffalo. Zialite is made by the **Tuttle Chemical Company,** 245 Seventh Avenue, New York.

The Belke Company, for the handling of the Zialite solution has added some widely known men in the plating field, namely, **Jacob Hay** and **F. G. Cyrex.** Mr. Hay was formerly foreman of the Eaton Spring and Axle Company; was in charge of the Corcoran Brown Lamp Company, Grisby-Grunow and other firms of like importance. Mr. Cyrex was formerly the Cleveland sales manager of the Hanson-Van Winkle-Munning Company, and is very well known among the trade. Mr. Cyrex is to have control of the distribution of Zialite plating solution and the Belke plating equipment line in the Cleveland territory and will also take care of the accounts in Pittsburgh and Northern Pennsylvania. Mr. Hay is handling the accounts in Wisconsin and the State of Illinois, besides a large number of accounts in the metropolitan district of Chicago. **George L. Nankervis,** who is very widely known in Detroit, is handling the material in that section. **Mr. Abel** of the Abel Sales and Service, which is an adjunct of the Belke Manufacturing Company, is handling this material in Grand Rapids. **Harvie Johnson,** a very popular salesman of the Belke Manufacturing Company is handling the territory of Ohio and Indiana, while **Mr. Whitehead** is taking charge of the accounts in Louisville, Kentucky.

Anyone interested in the Zialite solution will kindly white directly to the Belke Manufacturing Company, 947 North Cicero Ave., Chicago, Ill. A representative will visit them within twenty-four hours.

For a description of Zialite, see **Metal Industry** for May, 1934, page 179.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Rubber Mending and Electric Tape. B. F. Goodrich Company, Akron, Ohio.

Thiokol. An ethylene tetrasulfide, having the chemical formula $C_2H_4S_4$; the base material supplied in its raw form to rubber and cable companies for fabrication. Used for linings, coatings, packing, gaskets, insulation, etc. Thiokol Corporation, Trenton, N. J.

Industrial Filters. A new line of Purolator oil filters for coolants on lathes and grinders, cup greases, compressed air, gasoline, lacquers, etc. Motor Improvements, Inc. Newark, N. J.

Centrifugal Blast Cleaning Machine; cleans various sized and shaped castings without the use of compressed air. Pangborn Corporation, Hagerstown, Md.

New Burnishing Barrel

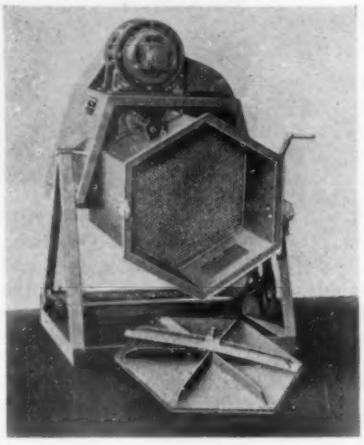
A burnishing barrel that makes available to the operator who handles small batches the economies effected by automatic transfer of burnishing balls is announced by N. Ransohoff, Inc., Cincinnati, Ohio.

Hitherto the "Ideal" system by which balls and work are automatically separated and balls recharged into the burnishing section without manual handling has been confined to barrels required by finishing departments operating on large batches. The new Ideal barrel may be charged with large work (as large as the barrel will accommodate) by removing the barrel head, which is held in place by a single central screw. Small work is loaded through the small door. Loading is accomplished with the door up and unloading with the door down, discharge being made directly to tote pans under the machine.

The hexagonal burnishing compartment is 12 in. deep, the hexagon measuring 24 in. side to side. The ball compartment is behind the perforated brass plate shown in the illustration.

When the barrel is loaded it is tilted to approximately 5 deg. below horizontal, tilting being effected by means of the crank at the right. The barrel is now rotated in burnishing direction, which brings the balls from the compartment in the rear to the burnishing section. A patented head and ball passage brings the balls into a space 1 in. wide between the patented head and the perforated plate, through which the balls work into the burnishing compartment.

When burnishing is completed, a turn of the crank tilts the barrel to 10 or 15 deg. above horizontal and rotation is reversed. This causes the balls to sift out of the work, through the perforated plate and the patented head returns them to the ball compartment. Cupped work, it is stated, is separated from balls in from five to seven minutes. A hollow shaft permits work and balls to be rinsed in the barrel during rotation. This is done when the barrel is tilted up and is in reverse. Water is introduced into the burnishing compartment, drains through the screen into the ball compartment where it leaves through a valve which is shown in the



New Ransohoff Burnishing Barrel

illustration on top of the barrel. The outlet is screen-protected to prevent the escape of balls. Work is unloaded, as already indicated, through the door and the barrel is ready for another operating cycle. No labor is required for handling balls. Because a heavier load of balls can be economically used, it is claimed, finishing is achieved more rapidly and the quality of the work is said to be greatly improved.

This Ideal barrel is furnished with wood or ¼ in. abrasion-resisting rubber lining, or unlined.

Goggles for Welding

Welding goggles which, it is stated, are adequately ventilated, yet of such design as to prevent foreign particles or light from entering the eye cups, are made by the Chicago Eye Shield Company, 2300 Warren Boulevard, Chicago,

Welding Goggles

Ill. The latest model is called style No. 527 Trojan Goggle. Special air channels in the edge of the cup under the lens and large side ports make possible normal circulation of air currents within the goggles, keeping them cool and comfortable and eliminating fogged lenses.

The right and left eye cups are molded individually of Bakelite, to fit the contour of the face. Welding lenses or cover glasses are easily changed by means of the screw cap construction. A new type rubber-covered ball chain bridge permits instant adjustment without twisting the cups.

Copper Covered Protected Metal

A special type of built up metal is made by the H. H. Robertson Company, Grant Building, Pittsburgh, Pa. It is the standard Robertson Protected Metal with the addition of a durable Anaconda Electro-Sheet Copper on the outside. This Electro-Sheet is one of the recent products of the Anaconda company. The Protected Metal itself consists of steel followed by a coating of asphalt, then asphalt felt, then another coat of asphalt. It is upon this base that the copper is applied.

Foundry Sands

A number of new developments have occurred in the past few years in foundry sands as buyers have become much more particular about the surface of their castings, both from the mold and the core.

One such development in core sands has been the production of finer grained sands for use in conjunction with core binders, which are practically free from gas. These new binders have made it possible for the foundry to use finer sands for core work than ever before. The Whitehead Brothers Company, 537 W. 27th Street, New York, has introduced Providence core sand and fine McConnellsville (New York State), core sand, for use where smooth cored surfaces are important.

In molding sands this company has put out their XX Amboy Molding Sand from northern New Jersey, which is made by combining a high silica grain with a bond that has a fusion point of 3200° F. Ingredients are carefully tested and closely controlled. The sand is recommended for making heavy castings without scabbing or blowing. In the southern Jersey district the company is blending highly refractory silica sand for nickel castings.

Another product which the Whitehead Company states is making considerable progress is known as Faceamol Shake-On. This material is a carbonaceous, cementatious product which, when shaken on to the face of a green sand mold, it is said, cements itself to the sand immediately, thus keeping the metal fluid, preventing mis-runs and washing of the sand surface, and acts as an insulation between the metal and the sand, permitting the casting to come clean from the mold.

The Whitehead Company has also, during 1934, gone into the refining of imported French sand. They are now taking the crude sand which they have imported for many years, milling it and offering it to the trade, ready for use without any further preparation.

Super Bright Metal Foil

A new metal foil, known as Super Bright Master Metal, has recently been put on the market by the Reynolds Metals Company, New York.

This foil, which is said to have a more brilliant finish than any hitherto known, is particularly recommended for the packaging of candy, and other products requiring maximum display-value at point of sale. Several candy companies have already adopted this material.

New Rite-Speed Lathe

The Hammond Machinery Builders, Inc., 1603 Douglas Ave., Kalamazoo, Michigan, announce another addition to their line of Rite-Speed lathes known as the type CCO Overhanging Spindle Lathe.

The Type CCO lathe has two separate and distinct spindles, each controlled independently of the other. Each spindle has its own motor, starter multi-V belt and switch. One spindle can be operated at a different speed than the other.

This machine is recommended for work where the wheels are changed frequently or the operation required two different speeds. Motors are mounted on rails on the back of the base and are of the totally enclosed, fan cooled type.

This machine is furnished with two 3 to 7½ HP. motors.

Hammond Overhanging Spindle Polishing Lathe

New Brazing Flux

A new flux to be called "Handy Flux," has just been announced by Handy & Harman, 82 Fulton Street, New York City. This new product is patented and manufactured only by Handy & Harman. It has been developed to speed up and improve brazing operations on either ferrous or non-ferrous metals and is particularly appropriate for use with "Handy" Silver Solders and Sil-Fos and Easy-Flo Brazing Alloys—products of this company.

It has a lower melting point than other fluxes used for the same purpose and permits taking full advantage of silver solders and brazing alloys having low flow points. Greater solvent action on a wide variety of oxides is said to be a feature that speeds up brazing and insures thorough wetting of joint surfaces at low brazing temperatures making it possible to obtain very strong and uniformly dependable joints.

This new flux is made up in paste form ready for use. It is said to work efficiently over a wide temperature range. Spreading rapidly over the work when heated, with less tendency to ball up or bubble, avoiding bare spots or the blowing away of flux by the force of the torch flame and the consequent oxidation, assuring an even distribution of the solder. The ordinarily hard to remove flux slags, it is stated, wash off readily with a little hot water.

Handy Flux is recommended by the manufacturers for brazing stainless steel, steel, monel metal, nickel, copper, brass, bronze and various other ferrous and non-ferrous metals and alloys. It is sold in one-half, one and five pound jars and is being widely distributed.

Catalogs

Precautions and Safe Practices in the Storage, Care and Handling of Oxy-Acetylene Welding and Cutting Equipment. The Linde Air Products Company, New York. (255)

"Meet the Family." A booklet describing the graphic recording instruments and indicators made by the Esterline-Angus Company, Indianapolis, Ind. (256)

Norbide, Norton Boron Carbide. "The hardest material ever produced by man for commercial use." Norton Company, Worcester, Mass. (257)

Density Comparator for Rapid Spectrographic Analysis. Bausch & Lomb Optical Company, Rochester, N. Y. (258)

The Small Littrow Spectrograph. Bausch & Lomb Optical Company, Rochester, N. Y. (259)

Polarizing Microscopes. Bausch & Lomb Optical Company, Rochester, N. Y. (260)

Gas Engines. A series of informative postal cards issued monthly by the Meriam Company, Cleveland, Ohio. (261)

Oil and Lubrication Data. A pamphlet containing operating instructions prepared jointly by the Meriam Company and the engineers of the Socony-Vacuum Oil Company. (262)

Pyrometers for Diesel Engine Exhaust Temperatures and for General Industrial Applications. Type JR., small sized, low resistance instruments. Thwing Instrument Company, Philadelphia, Pa. (263)

Surfacing Machines for Grinding and Sanding Flat Surfaces of Metal, etc. Peerless Surfacing Machine Company Division, Production Machine Company, Greenfield, Mass. (264)

Product Development. A new report issued by the Policyholders' Service Bureau, Metropolitan Life Insurance Company, New York. (265)

Integrity of Finishes Based on Bakelite Synthetic Resins. Bakelite Corporation, 247 Park Avenue, New York. (266)

Industry's Opportunity to Promote Recovery. Booklet No. 9 in a series of booklet-editorials by Allen W. Rucker in collaboration with N. W. Pickering, President, Farrel-Birmingham Company, Inc., Ansonia, Conn. (267)

Centrifugal Blast Cleaning Machine; works without compressed air. Pangborn Corporation, Haverstraw, Md. (268)

Save time. Use the coupon below to get any of the above catalogs or bulletins, or for data on any subject not mentioned this month. METAL INDUSTRY will see that you get them promptly.

METAL INDUSTRY
116 John Street, New York.

(Insert below the number in parentheses at end of each item desired.)

I wish to receive the following bulletins mentioned in December .....

.....

I want information on the following equipment or materials also: .....

.....

Associations and Societies

Chicago Chapter, A. S. M.

1440 W. Washington Boulevard, Chicago, Ill.

D. K. Crampton, Chief Metallurgist of the Research Department of the Chase Brass & Copper Company, will deliver his paper, "Copper and Copper Alloys," before the Chicago Chapter of the American Society for Metals at the next regular monthly meeting. The meeting is to be held December 13th, at the Medinah Club on North Michigan Avenue and will be preceded by a Chapter swim in the club pool and dinner for those who desire.

Mr. Crampton, in his paper, will deal with the fundamentals of copper and will give a brief review of the metallurgy of copper, from the mine to the finished product. He will also dwell upon the physical properties of copper and its alloy under various conditions.

Baltimore-Washington Branch, A. E. S.

207 S. Sharp Street, Baltimore, Md.

The annual dinner of the Baltimore-Washington Branch of the American Electroplaters' Society will be held on Saturday, February 2, 1935. Full details will be published in a later issue.

Philadelphia Branch, A.E.S.

c/o George Gehling, 5001 Tulip St.

The Philadelphia Branch of the American Electroplaters' Society held its annual meeting and banquet on Saturday, November 24, at "Adams," 13th and Spring Garden Streets, Philadelphia, Pa. It was a most successful meeting, the attendance at the banquet being over 200. A list of the papers read is given below.

1. **Efficiency of a Horizontal Plating Barrel,** by **Albert Hirsch,** foreman plater, Carey-McFall Company, Philadelphia, Pa.
2. **The Mechanism of Electrodeposition,** by **Dr. H. S. Lukens,** director, Department of Chemistry and Chemical Engineering, University of Pennsylvania, Philadelphia.
3. **Compensating Rheostats for Electroplating,** by **Gustav Soderberg,** Udylite Company, Detroit, Mich.
4. **The Measurement of the Thickness of Electrodeposits by Means of the Knight Thickness Meter,** by **O. Knight,** Knight Brothers, New York.
5. **Specifications and Tests for Plating on Steel,** by **Dr. William Blum,** Bureau of Standards, Washington, D. C.

Durable Goods Industries Committee

729 15th Street, N.W., Washington, D. C.

The Durable Goods Industries Committee is endeavoring to unite all of the manufacturers in its industries and to formulate a general policy in order to deal more effectively with the problems of national and industrial recovery. At a meeting in Hot Springs, Va., September 14 and 15, the Durable Goods Council was organized consisting of a delegate and an alternate from each one of the durable goods industries.

Details of the work of this organization can be obtained from the headquarters at the address given above.

Fabricated Metal Products Federation

729 15th Street, N. W., Washington, D. C.

The first annual meeting of this Federation was held in Cleveland, October 31st. The sessions were devoted largely to reports of officers and committees. An address was made by **Ernest White,** Assistant Deputy Administrator of the N. R. A.

H. S. Kimball, Managing Director, reported that the membership in the Federation October 1st consisted of 120 trade associations and 709 individuals. Among the officers elected for the ensuing year were: President, **W. M. Goss,** Vice-president, Scovill Manufacturing Company, Waterbury, Conn.; Vice-president, **A. J. Kieckhefer,** President, National Enameling and Stamping Company, Milwaukee, Wis. Among the 24 directors elected were: **E. F. Copp,** General Manager, Waterbury Manufacturing Company, Division of Chase Companies, Waterbury, Conn.; **I. L. Ferris,** Bridgeport Metal Goods Manufacturing Company, Bridgeport, Conn.; **James Gerity, Jr.,** President Master Electro-Platers' Institute, Toledo, Ohio; **W. M. Goss,** Vice-president, Scovill Manufacturing Company; **Ely Griswold,** Vice-president, Griswold Manufacturing Company, Erie, Pa.; **A. J. Kieckhefer,** President, National Enameling and Stamping Company, Milwaukee; **H. R. Naylor,** Seymour Products Company, Seymour, Conn.

National Founders Association

29 S. La Salle Street, Chicago, Ill.

The National Founders Association held its 38th annual convention at the Waldorf-Astoria Hotel, November 14-15. Its program included speeches on the economic situation by **Thomas W. Pangborn,** president of the Association, **Virgil Jordan,** president of the National Industrial Conference Board, **J. A. Milholland,** vice-president, Bank of the Manhattan Company of New York, **F. H. Clausen,** vice-president, of the Association, **Whiting Williams,** publicist and **David R. Clarke,** attorney. Papers on industrial subjects were read by **E. O. Jones** on "Dust Problems," and **F. Robertson Jones** on "Problems of Compensation for Occupational Diseases."

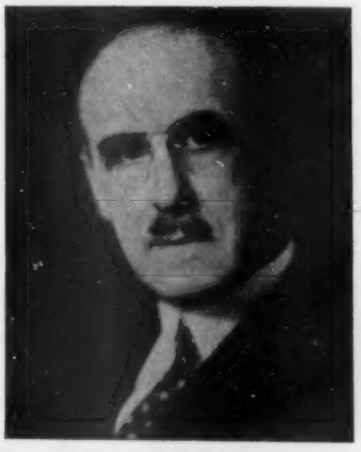
Thomas W. Pangborn, Pangborn Corporation, Hagerstown, Md., was elected president.

Personals

Dr. Becket Elected Honorary Member of Electrochemical Society

At its meeting held September 26, 1934, the Board of Directors of the Electrochemical Society unanimously adopted the following resolution:

WHEREAS, It has been the policy of the Electrochemical Society, Inc., to honor certain individuals from time to time for conspicious service in the advancement of electrochemistry by electing them to honorary membership in the Society and



DR. F. M. BECKET

WHEREAS, Frederick Mark Becket, through his oustanding contributions to the development of new metallurgical products by the help of the current, through his contributions to electrochemical literature, by his competent and unselfish services rendered the Society while functioning as a member of the committees and in executive capacities, and through his continued interest in the advancement of electrochemical processes while serving as a valued executive in industry, has, in our judgment, demonstrated his fitness to receive the award of honorary membership in our Society,

The Electrochemical Society deems it an honor and privilege to elect Frederick Mark Becket to honorary membership in The Electrochemical Society, Inc.

Dr. Becket was born in Montreal, Canada, on January 11, 1875. He attended McGill and Columbia Universities, receiving his degree of B.Sc. from McGill in 1895, and his M.A. from Columbia in 1899. In 1929, Columbia bestowed upon him the honorary degree of Doctor of Science, and in 1934, Mc-

Gill bestowed upon him the honorary degree of Doctor of Laws.

During the early years of his professional career, Dr. Becket was associated with the Westinghouse Electric & Manufacturing Company at East Pittsburgh; the Acker Process Company at Jersey City and Niagara Falls; the Ampere Electrochemical Company also of Niagara Falls; He was one of the organizers and was associated with, until 1906, the Niagara Research Laboratories, which then were absorbed by Electro Metallurgical Company. Since 1906 he has been associated with the Electro Metallurgical Company and the Union Carbide Company. He is Vice-President of these two companies and President of Union Carbide and Carbon Research Laboratories, Inc.

In 1924 the affiliated chemical and electrochemical Societies of America bestowed upon Dr. Becket the Perkin Medal. He has been very active in the Electrochemical Society, serving on many committees and as President of the Society in 1925. In 1933, Dr. Becket served as president of the American Institute of Mining and Metallurgical Engineers. More than one hundred patents have been granted to Dr. Becket, covering a wide range of electric furnace and chemical products, notably ferro-alloys, calcium carbide and the special chromium steels. Some of the processes early developed by Dr. Becket for the production of low carbon ferro-alloys today have world-wide application.

A. J. Wadhams, Manager, Development and Research, The International Nickel Company, Inc., New York, has announced the addition of **David M. Curry** to the Development and Research Staff. Mr. Curry will make his headquarters in New York and will devote his time to development work in the non-ferrous casting field, covering the entire range of foundry operations. He expects to spend the next six weeks in the Detroit area. While in Detroit he will operate out of the district office of The International Nickel Company in the General Motors Building. Mr. Curry was for eleven years associated with the Ford Motor Company, occupying the position of Assistant Superintendent of Foundry Departments. During that time he supervised the production of all non-ferrous castings used in the construction of Ford and Lincoln motor cars and Ford and Stout airplanes and airplane engines. He was later with the Federal Mogul Corporation of Detroit in charge of all foundry activities, and in recent years carried on an extensive consulting practice in the middle west.

Clarence Glass who has been associated with the Anaconda companies for nearly 30 years, has been elected vice-president of the Anaconda Sales Company, succeeding the late **John F. McCarthy.** Mr. Glass was first connected with Anaconda in the United Metals Selling Company, advancing through the traffic department and becoming assistant sales manager, handling the distribution of lead and zinc. He was active in the promotion of sales of metals for the company.

David Levow has been appointed salesman for American Tube Works, Somerville, Mass., specializing in sheet copper, with headquarters at 308 West 20th Street, New York. The American Tube Works have been making brass and copper pipe since 1851, and have recently entered the field of sheet copper. Mr. Levow, having been connected in similar capacity with the Taunton-New Bedford Copper Company for about 15 years, is well known to the trade.

E. P. Polushkin, has joined the staff of Lucius Pitkin, Inc., 47 Fulton Street, New York, as associate metallurgist, specializing in research and development. Mr. Polushkin was formerly instructor in metallography at the School of Mines, Columbia University, and lecturer on metallurgy at the School of Dentistry.

J. D. Keresey, President of the Anaconda Wire and Cable Company, and **G. H. Bucher,** President, Westinghouse Electric International Company, were elected Directors of the **American Manufacturers Export Association,** at a recent meeting. **James D. Mooney,** President of General Motors Export Company, was re-elected President.

H. Foster Bain, Managing Director of the Copper and Brass Research Association, New York, retired from that post at the end of November. He will spend some time traveling abroad.

Thomas A. Wright, Secretary of Lucius Pitkin, Inc., New York, and President of The Buffalo Testing Laboratories, Buffalo, N. Y., was recently elected President of The Association of Consulting Chemists and Chemical Engineers.

O. B. J. Fraser, Superintendent of Technical Service for The International Nickel Company, Inc., New York, will deliver a talk December 19th before the Washington (D. C.) Society of Engineers at the Cosmos Club in which he will discuss "Corrosion from a General Engineering Standpoint."

W. H. Bassett, Jr., Anaconda Wire and Cable Company, has been appointed by the American Society for Testing Materials as representative on the Sectional Committee on Insulated Wire and Cable.

H. C. Jennison, American Brass Company, has been appointed by the American Society for Testing Materials as representative on the Non-Ferrous Metals Division of the Society of Automotive Engineers.

W. R. Webster, Bridgeport Brass Company and **H. C. Jennison,** American Brass Company, have been appointed to the Joint Committee on Trolley Wire Specifications by the American Society for Testing Materials.

J. R. Townsend, Bell Telephone Laboratories, Inc., has been elected chairman of the Committee on Die Cast Metals and Alloys of the American Society for Testing Materials.

Sam Tour, Lucius Pitkin, Inc., New York, has been elected chairman of the Committee on Light Metals and Alloys, Cast and Wroughts of the American Society for Testing Materials.

J. L. Blackshaw, formerly of the Research Laboratory staff of the American Society of Heating and Ventilating Engineers, Pittsburgh, has been appointed to a post in the Building Products Division of the Reynolds Metals Company of New York. Mr. Blackshaw will have complete charge of heating, ventilating and related technical problems in connection with Reynolds Metallation, the company's metal and foil insulation.

Noble R. Patterson, eleven years with the International Harvester Company, Fort Wayne, Ind., has joined the organization of Aluminum Industries, Inc., Cincinnati, Ohio, as sales engineer.

F. R. Hoadley, Vice-president, Farrel-Birmingham Company, Inc., Ansonia, Conn., delivered an address before the Providence section of the American Society of Mechanical Engineers on November 9th, on The Problems Confronting the Durable Goods Industries.

R. L. Binney, Binney Castings Company, Toledo, Ohio; **Leon B. Thomas,** Ohio Brass Company, Mansfield, Ohio, and **A. W. Schuller,** Reliance Bronze and Aluminum Foundry Company, Philadelphia, Pa., were among the fortunate winners of prizes in the Mystery Night program of the American Foundrymen's Association at its recent convention in Philadelphia, October 22-26.

M. L. Bettcher has been promoted from the post of General Superintendent to General Manager of the Duriron Company, Inc., Dayton, Ohio.

Dudley H. Miller, General Manager has been appointed Executive Vice-president of the Duriron Company, Inc., Dayton, Ohio.

N. E. Philpot, Manager of the Chicago office of the Duriron Company Inc., has been placed in charge of the New York office, succeeding **W. E. Pratt,** resigned.

Col. M. W. Smith, Manager of the Buffalo office of the Duriron Company, Inc., Dayton, Ohio, has been placed in charge of the Chicago office.

W. A. Watkins, has been transferred from the general sales department of the Duriron Company, Inc., Dayton, to the Buffalo office as Manager.

Sam Tour, vice-president, Lucius Pitkin, Inc., New York, has been elected a director of the American Foundrymen's Association for a three-year term.

Professor William Campbell, Howe Professor of Metallurgy at Columbia University, New York, has been elected Honorary Chairman of Committee B-2 of the American Society for Testing Materials, after 25 years as Chairman.

William J. Baldwin has been appointed Industrial Fellow at the Mellon Institute, Pittsburgh, Pa., to investigate scientifically, problems of importance in enamel technology. This Fellowship was founded by the O. Hommel Company, Pittsburgh.

Obituaries

Bradford H. Divine

Bradford H. Divine, 65, president of Divine Brothers Company and one of the leading business men in Central New York, died at his home in Utica, Saturday night, Nov. 24.

He was the author of many articles on mechanics and engineering matters pertaining to his business. He was the inventor of polishing and buffing devices which have been put into international use. His concern was internationally known for the manufacture of tools and machines for flexible grinding, polishing and buffing.

He was born in Utica July 5, 1869.

B. H. DIVINE

When a young man he was employed with the Overman Wheel Company, bicycle makers at Chicopee Falls, Mass. When Mr. Divine returned to Utica to start his buffing wheel business he first made wheels in the basement of his father's home. Year by year the business grew until the sizeable factory was erected on Whitesboro Street.

The corporation's product is used throughout the world where metal manufacturing is done. In addition to the many machines developed by the concern, it developed a staff of engineers who became recognized authorities on matters pertaining to abrasive finishing processes.

In 1926, Mr. Divine was elected a fellow of the Royal Society of Arts in London when there were only four other American members. He was an enthusiastic and able hunter having hunted in Canada, Alaska and the Central Americas. In the Adirondacks he was known as "One Shot" Divine.

He belonged to many local clubs, was a member of the American Society of Mechanical Engineers and the Engineers Club, New York.—E. K. B.

Jacob A. Rappaport

Jacob A. Rappaport died of strangulation when his tie became entangled with machinery in the plant of the Reliance Bronze and Steel Corporation, 95 Dobbin Street, Brooklyn. Mr. Rappaport was president of the company. The body was discovered by M. Cohen, an engineer in the plant, who notified the police, whose investigation convinced them that the death had been accidental. Mr. Rappaport was 53 years old and lived at 146 Central Park West, N. Y.

Mr. Rappaport was an outstanding figure in the Building Construction field. A native of Russia he came to this country in 1891. Recognizing the great strides being taken in fireproof building construction, he entered the field with the National Fireproof Door Company in 1904. From there he went to the Columbia Fireproof Door Company where the management recognizing his worth made him a junior partner. A few years later he left this company to go into the building business. The real estate panic of 1907 wiped out his entire holdings.

In 1909 Mr. Rappaport organized the Reliance Fireproof Door Company manufacturing kalamein doors. From a business of $50,000 a year he ran it until the sales volume averaged over several million dollars a year. In 1929 he merged this company with Howell, Field & Goddard, Inc., the Knoburn Products Company and the United Pressed Steel Products Company under the name of the Reliance Bronze & Steel Corporation. This company employing over 1200 people did an annual business in excess of $6,000,000.

Some of their noted jobs are the Hotel New Yorker, City Bank Farmers Trust Building, Chanin Building, Hotel Biltmore and Majestic Apartments.

JACOB A. RAPPAPORT

At the time of his death Mr. Rappaport had been working on plans for a fabricated steel house feeling that design and practability would be the necessary thing to further this coming development in the Metal Trade.

Mr. Rappaport was instrumental in writing the NRA Code for the Kalamein Industry and was President of the National Kalamein Association representing that group in Washington.

He was a Mason, a member of the Grand Street Boys and several other philanthropic as well as social clubs.

William A. Parker

William A. Parker of Parker White Metal & Machine Company, Erie, Pennsylvania, whose death was noted in our November issue, passed away October 17, 1934 at his home following an extended illness. Mr. Parker founded the Parker White Metal & Machine Company in 1906 and remained as its active head until forced to leave by illness which resulted in his death.

WILLIAM A. PARKER

He was one of the pioneers in the die casting field and well known for his ingenuity and ability. This company started from a very humble beginning and has expanded under his able guidance to its present position in the field.

Mr. Norman A. Parker, who has been with this business for many years, and has been acting head during his father's illness, will become head of the company.

Charles L. Fenner

Charles L. Fenner of Utica, N. Y., one of the founders of the Seneca Brass & Plating Works, and treasurer of that concern for 20 years, died in December.

Henry Bergfels

Henry Bergfels whose death was reported in our November issue, was born in Newark, N. J., July 21, 1863, and attended the old school at Elizabeth and Chancellor Avenues, Lyons Farms, which is now part of Newark.

The Newark Nickel Plating Company, of which Mr. Bergfels was president and owner was founded by his father, William H. Bergfels and himself in 1880 when they took over the plating business of Moore and Nelson which was established in 1872.

In the eighties and nineties Mr. Bergfels was often called to other parts of the country on plating problems as a consulting plater. He plated the first wheels used for the making of films by the Celluloid Company of Newark. He was a very close friend of Dr. Goodwin the inventor of the film and helped him in many of his experiments. A problem which he turned down as impractical was the copper plating of the inside of the Statue of Liberty. His biggest accomplishment was copper plating the hull of an ocean-going tug, 110 ft. long, in 1894.

For many years the firm manufactured fancy brass goods, such as the Bergfels bicycle saddle, lamps and various spinnings. In 1895 they discontinued the fancy brass goods, keeping to the plating and spinning and then in 1921, gave up the spinning and devoting all their time to the electroplating business.

HENRY BERGFELS

For many years Mr. Bergfels was active in the American Electroplaters' Society of Newark. Mr. Bergfels was also active in the industrial, social and fraternal life of Newark. He was a member of the South Baptist Church, one of the founders of the Newark Camera Club, a member of St. John's Lodge 1, F. & A. M. of N. J. for 38 years, and an officer for 37 years and a member of other Masonic bodies. For the last 14 years he was president of the Masonic Veterans' of Newark; also treasurer of the Board of Trustees of the Home for Incurables and Convalescents.

Richard C. Faunt

Richard C. Faunt died recently. Mr. Faunt was founder and president of the Faunt Brothers, brass foundry, Chicago.

Francis J. Youngblood

Francis J. Youngblood for the past 12 years manager of costs for the Detroit Brass and Malleable Works, Detroit and Wyandotte, Mich., died October 21. Mr. Youngblood was 54 years old. He was a graduate in mechanical engineering of Stevens Institute of Technology, and formerly was associated with J. G. Brill Car Company and the British Westinghouse.

Harry R. Sinclair

Harry R. Sinclair died October 11 at the age of 62. Mr. Sinclair was president of the Worcester Stamped Metal Company, Worcester, Mass. He became president of the company in 1916 when it succeeded the W & S Manufacturing Company.

John B. Korb

John B. Korb for nearly 50 years in the manufacturing jewelry business died November 1st, at the age of 78. Mr. Korb had retired from business several years ago. Two daughters survive.

Edward F. Lasar

Edward F. Lasar, who founded the Lasar Mfg. Co., ornamental iron and bronze, 40 years ago in St. Louis, and was its head until he retired in 1925, died of pneumonia at his home in Vero Beach, Fla., on Nov. 17, aged 75 years. He had lived in Florida since he relinquished active control of the business to his son, Edward G. Lasar, president, although he continued as vice-president.

Clyde A. Miller

Funeral services were held in Waterbury, Conn., October 23rd, for the late Clyde A. Miller, construction superintendent of the Toronto branch of the American Brass Company, who died on November 19, in Canada. He was a member of the American Society of Civil Engineers.

Mr. Miller was a native of Waterbury, the son of Mr. and Mrs. Charles S. Miller of Cheshire Road. He was a graduate of the East Farms School and the Waterbury High School. He was graduated from Lafayette College in 1907. He was first stationed at the local office of the American Brass Company and later at the Torrington plant. He also served several years as city engineer of the city of Torrington.

Industrial and Financial News

News of the Codes in the Metal Industries

COPPER

H. O. King, Managing Director of the **Copper Code Authority** addressed the **Philadelphia Metals Association** on November 15th.

Mr. King stated that the Code assured an outlet of 10,000 tons of scrap per month, but that refiners, since they could not foresee the price of electrolytic copper, could not establish a permanent basis for scrap prices. He pointed out also that without the Code, electrolytic copper might be selling at 5 cents.

The Association decided to appoint a committee to confer with Mr. King on the question of eliminating purchasing competition between refiners and dealers.

COPPER AND BRASS MILL PRODUCTS

The following members of the Code Authority have been approved by the Administration:

Alternate members—**W. M. Goss,** Scovill Manufacturing Company, Waterbury, Conn., alternate to **E. O. Goss; R. L. Coe,** Chase Brass and Copper Company, Waterbury, alternate to **F. S. Chase; J. A. Doucett,** Revere Copper and Brass, Inc., New York, alternate to **C. D. Dallas; F. E. Weaver,** American Brass Company, Waterbury, alternate to **John A. Coe; H. W. Steinkraus,** Bridgeport Brass Company, Bridgeport, Conn., alternate to **R. E. Day; L. E. Strasburg,** Mueller Brass Company, Port Huron, Mich., alternate to **F. L. Riggin.** Alternate to **J. P. Lally** has not been chosen.

GALVANIZED WIRE

Terms of payment set by the Supplementary Code have been modified for six months. The new provision permits a 2% discount for payment in ten days from the end of the month succeeding date of invoice, on domestic sales, and a 2% discount for payment within ten days after receipt of documents, on export sales.

COPPER, BRASS, BRONZE AND RELATED ALLOYS

The Code Authority for the Copper, Brass, Bronze and Related Alloys Trade has ordered the filing of prices by the members of this industry; this order effective December 10th.

The following members of the Code Authority have been approved by the Administration:

Members of Associations—C. H.

Krueger, Chase Brass & Copper Company, New York, N. Y.; **Joseph Stelwagon,** Stelwagon Manufacturing Company, Philadelphia, Pa.; **J. J. Whitehead,** Whitehead Metal Products Company, New York, N. Y. **Non-members of Associations—J. P. Lally,** C. G. Hussey & Company, Pittsburgh, Pa.; **H. V. Steinkraus,** Bridgeport Brass Company, Bridgeport, Conn.

ELECTROPLATING INDUSTRY

The following members of the Supplementary Code Authority have been approved by the Administration:

John E. Esposito, Progressive Plating & Enameling Company, Oakland; **W. E. Carr,** Carr Plating Company, San Antonio; **William Shephard,** Shephard Plating Company, Racine; **E. A. Rottman,** City Plating & Manufacturing Company, St. Louis; **H. C. Simmons,** Simmons Plating Company, Atlanta; **R. T. Marshall,** Worcester Brass & Electro-Plating Company, Worcester; **Philip Sievering Jr.,** Philip Sievering, Inc., New York; **F. F. Pierdon,** Art Metal Finishing Company, Washington, D. C.; **Albert Kriese,** Climax Machinery Company, Indianapolis; **H. M. Karet,** Keystone Chromium Corporation, Buffalo; **James E. Nagle,** James E. Nagle & Sons, Toledo; **Leo D. Jensen,** Chromium Corporation of America, Chicago; **Edward Hodeker,** Hodeker Brothers, Newark; **Arthur Lyons,** Hugh Lyons & Co., Lansing.

For a complete report of the Code Authority meeting at which these members were elected, see **Metal Industry** for November, 1934, pages 397-398.

ALUMINUM WIRE AND CABLE

The National Industrial Recovery Board has ruled that the manufacture of aluminum wire and cable is subject to the Code of the Aluminum Industry and not the Code of Electrical Manufacturing Industry.

SECONDARY ALUMINUM

The Code Authority has submitted to the National Industrial Recovery Board a list of occupations deemed hazardous or detrimental to the health of persons under 18 years of age. This list includes: any work in the foundry proper; cleaning or grinding; exposure to molten aluminum; employment on metal scrap; employment on motor vehicles; operation of engines and prime movers; employment on hoisting apparatus; work on machinery, belts, pulleys or shaftings in motion. Copies of this list are available at the office of the National Recovery Administration, Rm. 3323, Department of Commerce Building, Washington, D. C.

ALLOYS

F. W. Cohen of the Metal and Thermit Corporation, New York, has been appointed member of the Code Authority to represent members of the industry, not members of the American Alloy Producers Association.

Association members of the Code Authority approved by the Administration are as follows: **A. Corey, Jr.,** Vanadium Corporation of America, New York; **W. F. Meredith,** Titanium Alloy Manufacturing Company, New York; **J. M. Price,** Electro Metallurgical Sales Corporation, New York; **F. P. Gormely,** Electro Metallurgical Company, New York; **Paul Kruesi,** Southern Ferro Alloys Company, Chattanooga, Tenn.; **L. G. Pritz,** Ohio-Ferro Alloys Company, Canton, Ohio; **Max Schott,** Climax Molybdenum Company, New York.

SCRAP TRADE

Charles M. Haskins, 1475 Broadway, New York, has been approved by the Administration as National Treasurer in charge of the collection and distribution of code authority assessments, for the five divisions of the Waste Material Trade, which includes non-ferrous scrap metal. The budgets for the various branches of this trade have also been approved by the Administration.

Eldon R. Carl has been appointed N. R. A. Labor Advisory Board Representative on the Code Authority.

Members of the Code Authority for Non-Ferrous Scrap Metals and other waste materials who have been approved by the Administration are as follows: **M. V. Bonomo,** Schiavone-Bonomo Corporation, New York, chairman; **Dan R. Cohen,** D. R. & F. A. Cohen, Chicago, secretary; **Joseph V. Kiley,** T. J. Kiley & Son, Boston; **Samuel Appel,** Samuel Appel Company, Fort Wayne, Ind.; **Saul Brown,** N. Brown & Sons Company, Pittsburgh.

The **Empire Metal Merchants Association** recently filed a protest with the Code Committee of the Scrap Metals Trade on the assessment to finance the operation of the Code. Among the reasons stated was that the waste material trade has had no benefits from the Code and that the assessment was oppressive.

Metal Developments

It has been reported by the **Dow Jones Company,** unofficially, that the **Reynolds Metals Company,** New York, recently made a purchase of 15,000,000 pounds of aluminum from the **Aluminum Company of America.**

According to the **Economic Review of the Soviet Union, Russia** produced almost 10,000 tons of aluminum in the first nine months of 1934. This represents an increase of more than 277 per cent over the same period in 1933.

According to a report of the **National Industrial Conference Board,** business improved more than seasonally in October. The gains in building, engineering construction and distribution and retail trade overcame some declines in production. Residential construction was the outstanding industry.

Lyman J. Briggs, director of the Bureau of Standards, Washington, D. C., recently stated that the work of the Research Associate supported by the Non-Ferrous Ingot Metal Industry at the Bureau of Standards is a good example of the value of these co-operative researches by which the Bureau and industries work together on their basic problems. The work on which this Associate was engaged consisted of an investigation into red brass, an abstract of which was published in The **Metal Industry** for August, 1934, page 265.

Udylite cadmium plating was displayed at an aeronautical exhibition recently held in Milan, Italy.

Flexible metal bags for perishable food products are now being manufactured successfully on a large scale by the Reynolds Metals Company of New York. These bags are made for food products, candy, etc.

A truck loaded with **silver sludge,** en route from the plant of the **Eastman Kodak Company,** Rochester, N. Y., to the **Irvington Smelting and Refining Company,** Irvington, N. J., mysteriously disappeared. After a police alarm was sent out, the truck arrived at its destination safely. The delay had been caused by a breakdown.

Gold plated bath fixtures are on the increase in Long Island estates according to a report from the **Carlton-Cooke Plating Corporation,** New York. According to this report a good plating job which will last about twenty years can be done for $500, making the annual cost only $25 per year, and at the same time eliminating the expense of labor and materials in polishing.

Tennis court lines made of **lead tape** are said to be coming into popularity, according to an article published in Lead for November, 1934.

W. R. Webster is chairman of the Employment Relations Committee of the **National Association of Manufacturers,** which recently announced that it would make a drive against coercion on the part of labor unions. They will urge state legislatures to enact certain provisions into law such as: making sympathetic strikes and sympathetic lockouts illegal; making both employees and unions equally responsible for the observance of contracts; making picketing illegal when it is carried on in such

a manner as to intimidate or coerce employees or customers; to declare illegal, employment contracts requiring a person either to join or not to join any labor organization; to make it illegal for any association of employers or employees to punish members for refusing to participate in illegal strike or lockout; to require written consent of the employee before any deduction may be made of any part of his wages for the payment of organization dues.

In a recently published report of the **principal manufactures of rolling mill products** in the Census of Manufactures for 1933 by the U. S. Department of Commerce, it was stated that nonferrous bolts, nuts, rivets, washers, etc., were turned out to a value of $1,493,308 in that year.

The will of the late **Ludwig Vogelstein,** chairman of the board of the **American Metal Company, Ltd.,** who died on September 23rd, left about $600,000 in gifts to relatives, friends and employees.

Copper bearing malleable iron has been found to have certain advantages over ordinary unalloyed malleable cast iron by C. H. Lorig and C. S. Smith. The authors read a paper on this subject at the recent Foundrymen's Convention in Philadelphia. (See pages 369-373 of November **Metal Industry**).

The **aluminum cap** of the Washington Monument was inspected last month and, according to a report in Aluminum News-Letter, showed no more deterioration after 50 years of use than would be encountered after three months to a year in industrial atmospheres.

Non-Ferrous Alloys and Products

Wage-earner employment in the manufacture of nonferrous-metal alloys and products (not including aluminum products) in the United States increased considerably during the spring and summer of 1933 and decreased somewhat in the fall, but remained at a much higher level in December than that attained in March, according to a preliminary report compiled from data collected in the Biennial Census of Manufactures taken in 1934, released November 26, by Director William L. Austin, Bureau of the Census, Department of Commerce. The report shows 36,790 wage earners on the pay rolls in March, 42,310 in June, 51,109 in September, and 47,576 in December. The figures for September and December are larger than the corresponding figures for 1931 (the last preceding census year).

The total value of products made by establishments engaged primarily in the manufacture of nonferrous-metal alloys and products in 1933 amounted to $239,155,936 (at f.o.b. factory prices), as against $331,438,974 reported for 1931 and $909,804,050 for 1929. The rates of decrease for the two biennial periods are: 1931-1933, 27.8 per cent; 1929-1931, 63.6 per cent. The principal items contributing to the 1933 total are: Plates and sheets, $58,524,377; rods, $31,095,824; tubing and pipe, $23,901,960; ingots and pigs, $18,991,184; rough castings, $21,692,912.

This industry, as defined for census purposes, embraces establishments engaged primarily in the production of (a) nonferrous alloys, (b) products made of nonferrous alloys, and (c) products made of nonferrous metals other than aluminum, except products of classes (b) and (c) specifically assigned to other industries. The chief classes of nonferrous products thus assigned are wire and wire products, plumbers' supplies, electrical apparatus, lighting equipment, structural and ornamental metal work, hardware, and screw-machine products. These products are not covered by this report except to the extent to which they are manufactured as secondary products by the establishments classified in this industry.

Copies of the complete report can be obtained from the Bureau of the Census, Washington, D. C.

Earnings of Companies

Net profit unless followed by (L) which is loss

	1934	1933
Alemite Die Casting & Manufacturing Company (9 months)	$45,542(L)	.....
N. J. Zinc Company (3rd quarter)	746,637	1,514,909
N. J. Zinc Company (9 months)	2,833,149	2,885,290
Baltimore Tube Company (3rd quarter)	12,126	11,682
Baltimore Tube Company (9 months)	26,937	23,095(L)
Vulcan Detinning Company (3rd quarter)	71,236	70,393
Vulcan Detinning Company (9 months)	229,495	164,389
Walworth Company (9 months)	11,166	797,708(L)
American Cyanamid Company (3rd quarter)	507,842	977,544
American Cyanamid Company (9 months)	1,573,988	1,500,811
International Nickel Company (3rd quarter)	4,005,166	3,773,130
International Nickel Company (9 months)	14,017,808	5,636,019
Bridgeport Brass Company (9 months)	392,944	225,838

Business Items-Verified

General Smelting Company, Philadelphia, Pa., has just completed and placed in operation a new plant and reverberatory furnace for the production of aluminum ingots. A complete line of aluminum alloys is being produced by the company which has been a producer of intermediate zinc for more than 30 years. The company operates a smelting and refining department.

J. Holland and Sons, Inc., 489 Broadway, Brooklyn, N. Y., have added to their business an additional warehouse of 10,000 sq. ft. located at 25-31 Johnson Avenue, Brooklyn, and are said to have the largest stock of used and rebuilt polishing and plating equipment in the East.

Receivers of the **Rumsey Pump Company,** Seneca Falls, N. Y., intend to continue to operate the firm as has been done heretofore. The company operates a fully equipped brass foundry and cast iron foundry, and also a machine shop for the manufacture of a general line of hydraulic pumping machinery.

The **Pfaudler Company,** Rochester, N. Y., has opened an office in the Square Park Building, Boston. M. J. Goodwin will be in charge of the new office and will be assisted by J. E. Soares and S. J. Green. The following departments are operated: brass machine shop, tool room, tinning, soldering, brazing, polishing and grinding room.

Hallenscheid & McDonald, 1344 W. Washington Blvd., Los Angeles, Calif., are manufacturing a new line of brass and chromium plated bath room fixtures under the name "Aristocrome." The company is represented in the East by **American Encaustic Tiling Company, Ltd.,** New York City and Maurer, N. J. The company also is contemplating the installation of a new and larger plating shop early next year.

Frank J. Quigan Company, Inc., Division of the United Carr Fastener Corporation, 31 Ames Street, Cambridge, Mass., is moving to 1230 Columbia Road, South Boston, Mass. This Division was formerly at 65 Roebling Street, Brooklyn, N. Y. The New York Office of the United Carr Fastener Corporation is at 15 East 26 Street, N. Y. The division known as the Casper Lowenstein, Inc., which manufactures the more expensive line of Ladies Hand Bag Frames, will remain at its present location, at 85 Roebling Street, Brooklyn, N. Y.

Production Machine Company, Greenfield, Mass., has purchased the entire business, good will, etc., of the **Peerless Machine Company,** Troy, N. Y., and has moved it to their factory at Greenfield. The Peerless company was the manufacturer of a line of vertical and horizontal abrasive belt surfacing machines, which will be further developed and improved.

The **Durham Manufacturing Company** acquired the building formerly occupied by the **Acme Machine Products Company,** which recently moved into larger and more spacious quarters. The Durham Company is setting up a production line in the former building of the **Acme Company** for the manufacture of chromium-plated tubular furniture.

Officials of the **Aluminum Workers' and Machinists' Union** recently were discussing the contents of a letter sent to its employees by the **Aluminum Goods Manufacturing Company.** The letter explained that the Company is always willing to meet a Committee representing any group of employees to discuss grievances and disputes and sets up the 40-hour week as the standard for the three plants of the company. At the meeting held at Two Rivers, the Union executives took steps to frame a reply to the company's letter. There has been no labor trouble at the Aluminum Goods plants. The company employs about 3,000 men and women. The following departments are operated: tool room, rolling mill, spinning, stamping, plating, polishing and lacquering.

A complete fume recovery equipment has been recently designed and installed by **The Northern Blower Company,** West 65th Street and Barberton Avenue, Cleveland, Ohio, for the purpose of recovering oxides at the blast furnaces of the **Rochester Smelting and Refining Company,** Rochester, N. Y.

That some lines in the "durable goods" industries have developed to a much greater extent than is generally believed is shown by the report of **The Meriam Company,** 1955 West 112th Street, Cleveland, Ohio, manufacturers of pressure and flow meters for liquids, steam and gases. The total sales of both types of instruments for the first ten months of this year are stated to exceed the average of the past eight years by nearly 50%. Compared with last year, these ten months of 1934 show a gain over the whole of 1933 of 48% in manometers, while the sales of indicating flow meters is tripled.

General Ceramics Company, manufacturers of acid-proof chemical stoneware, have moved their executive and sales offices into the R. C. A. Building, 30 Rockefeller Plaza, New York. This company's factories are located in Keasbey, N. J. and Metuchen, N. J.

The **Sheet Aluminum Corporation,** Jackson, Mich., has filed suit against the Aluminum Company of America, in the Federal District Court in Detroit, Mich., for $4,125,000, charging violation of anti-trust acts.

The **Non-Ferrous Foundry of True Alloys, Inc.,** 1820 Clay Avenue, Detroit, Michigan, has been taken over by **J. P. Carritte** and **J. P. Carritte, Jr.,** former executives of **Detroit Aluminum and Brass Corporation.** The new management will specialize on high-grade alloys of aluminum and bronze. A well-equipped jobbing plant, producing regular lines of aluminum and bronze, is in full operation for automobile, motor makers and general purpose work.

New Incorporations

Royal Metal Box Corporation, Brooklyn, N. Y., has been organized by Samuel and Roy Halper, 238 46th Street, and associates, to manufacture metal boxes and containers.

Excello Die Casting Company, 1140 Monroe Avenue, N.W., Grand Rapids, Mich., has been incorporated by Edward J. Hultman, president and general manager; S. C. Russell, secretary and treasurer; R. N. Brach, vice-president and a member of the board of directors. The company manufactures die castings and is now in position to supply zinc base castings from machines of its own design and manufacture. The following departments are operated: die casting shop, plating and polishing.

Edgar N. Dollin, former president of Allied and Acme Die Casting Corporations, has formed a new corporation which will be known as the **Dollin Corporation,** to take over the American Type Die Casting Division, and at the same time the die casting division of the Lionel Corporation. Associated with Mr. Dollin will be **J. L. Cowen** and **Mario Caruso.** The Dollin Corporation has taken over all the dies, equipment and tools of the two organizations. The die casting sales force of the American Type Founders has been taken over by the new corporation. **William Gebauer** will be chief engineer and production manager. The Dollin Corporation will remain at 300 Communipaw Avenue, Jersey City, N. J., until the latter part of December when it will move to Sager Place, Irvington, N. J.

The **Cole Battery Company,** Wilkensburg, Pa., has been organized and incorporated to operate a plant for the manufacture and distribution of storage batteries and kindred equipment. Principals of the new concern, capitalized at $30,000, are Mort Evans, C. E. Willock and C. E. Willock, Jr. This firm operates a casting shop.

Schwabe Pattern Company, Inc., Fort Wayne, Ind., has been organized by Richard J. Schwabe, Fort Wayne and associates, to manufacture metal patterns and kindred products; **R. J. Schwabe,** president and treasurer; **Mrs. A. B. Schwabe,** first vice-president; **Miss Ruth Schwabe,** second vice-president and **Virgil Eisenhut,** secretary.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

December 1, 1934.

Local brass manufacturing concerns have experienced a slight pick-up during the last month but production is still below the high point of a year ago last summer. The Chamber of Commerce reports that in all concerns employing 65 persons or more there were 113 more persons working in October than in September.

Henry Ford's announcement that he will produce no less than one million cars next year is bound to have an uplifting effect on local industries, **William M. Goss,** secretary of the **Scovill Manufacturing Company** said last month. It is impossible to say if they will get direct contracts for Ford parts, accessories or materials, he said, but in any event some of the materials going into the cars would come directly or indirectly from local industry. Many of the local brass concerns regularly manufacture hub caps, radiator caps and motor valves for Ford cars.

The Federal Housing Program is also expected to create a mild boom in local business according to factory officials. There has already been a slight increase in manufacture of household fixtures.

Beardsley & Wolcott Company officials say there has been a decided improvement in their business, that there has been an increase in employment since August of 130 per cent and that the working schedule has been increased from four to five days a week. Some government orders for equipment for federal camps in the mid-West.

Plume & Atwood Manufacturing Company, through its president, **Ralph L. French,** says there has been a slight increase but it is the usual seasonal one.

The Noera Manufacturing Company, a subsidiary of the **Chase Companies, Inc.,** has been awarded the bronze placque by the **National Safety Council** in honor of the fact that its employed have worked a full year or 186,842 man-hours with no loss of time accident. This is the fourth consecutive year it has received the award. **F. S. Chase,** president of the company, **F. A. Jackle, W. A. Clarke** and **W. A. Jarvis** made brief addresses at a noon day luncheon given all employees of the company last month when the placque was awarded. Praise

was given **James E. Bagley**, Chairman of the Safety Committee, as being largely responsible for the record.

Products of the **American Brass Company** and the Chase Companies are among those on display in the exhibition of contemporary American industrial art at the Metropolitan Museum of Art in New York.—W. R. B.

Connecticut Notes

December 1, 1934.

BRIDGEPORT—The **Bullard Company** reports current orders and production for stock indicates that there will be work for the key men of the plant up to next March at least. **President E. C. Bullard** says business is better than at any time since early in the year and that the company has received orders from the Middle West which, with the regular business, will keep most of the old employees for several months. While he mentioned no names it is understood that both the **Ford Company** and the **General Motors Company** placed orders.

H. G. Hook, assistant secretary and treasurer of the **Bassick Company**, reports that his company has received orders that denote improvement and increased volume but that the bulk of orders should arrive immediately after the 1935 automobile show.

Salesmen of **Remington Rand, Inc.**, from all parts of the country were in the city last month for a conference. They were told that the company's volume of sales for the first 10 months this year exceeded the totals for the 12 months of 1932 and 1933.

The **Dymaxion Corporation** has been organized here with $10,000 cash paid in capital consisting of 10,000 shares of common stock, no par value. The officers are: President and treasurer, **Philip C. Pearson**; vice president, **Roger W. Sherman**; secretary and assistant treasurer, **William M. Parkhurst**. The company has developed a new three wheel automobile.

NEW HAVEN — **Harry Bushnell Brown**, president of the **McLagon Foundry Company**, died at his home here Nov. 22. He was associated with the late Fred B. Farnsworth in the foundry and machinery manufacturing business here for over 50 years. His father was **Henry B. Brown**, a well known machinery manufacturer of New Haven in the 70's.

BRISTOL—The **Reconstruction Finance Corporation** will loan the **Sessions Clock Company** $140,000, **Atty. S. Russel Mink**, representing the company, announced last month. The loan will enable the company to pay up all its back taxes and make some improvements.

The Bristol Brass Company will call for redemption on December 31, all of its 1,928 outstanding preferred shares at $110 per share. The company also declared dividends on its preferred and common stocks.

NEW BRITAIN—The **New Britain Machine Company** and **Goss & DeLeeuw** report an upturn in the machinery business.

Providence, R. I.

December 1, 1934.

As the final month of 1934 dawns the prospects of any immediate improvement in the various lines of the metal trades industries are far from encouraging. During the past couple of months these trades in Rhode Island have slackened their pace very materially. The new year will open with a tendency on the part of manufacturers in these lines, to drift aimlessly until some definite knowledge is obtained from Washington as to what the administration intends to do with the monetary, budget, NRA and other problems, uncertainties of which are the most deterent factors in business recovery.

B. B. Jewelry Company, Inc., Providence, has been incorporated to conduct a manufacturing jewelry business; with capital, 100 shares, common stock, no par value. Incorporators: **Ben James Bazelon, Augustus Bazelon** and **D. Donnelly**, all of Providence.

In the inventory of a local estate filed in the Municipal Court of Providence a few days ago, fifteen shares of **Gorham, Inc.**, common stock was appraised at $30 and eighty-three shares of **Gorham Manufacturing Company** common at $1,338.38.

The contract has been awarded for a brick addition, 83 x 35 feet, to the plant of the **General Plate Company**, at Attleboro, to cost around $30,000.

The regular monthly meeting of the **Metal Finding Manufacturers Association** was held Wednesday, Nov. 7, in one of the dining rooms of the Narragansett Hotel, where the usual luncheon was served. President **Frederick A. Ballou, Jr.**, conducted the meeting which was devoted to the consideration of routine reports and a discussion of the industry, business prospects and code conditions.

The report of **Charles H. Eden**, receiver for the **A. B. Manufacturing Company**, manufacturing jewelers, 185 Eddy Street, Providence, has been allowed by a decree entered in the Superior Court by Presiding Justice Hugh B. Baker. The final decree authorized the receiver to distribute the cash balance in his hands pro rata among the creditors.

W. H. M.

Middle Atlantic States

Utica, N. Y.

December 1, 1934.

Slight increase in business was reported in some quarters of Central New York but the general tone during the past few months has not been overly optimistic.

Savage Arms Corporation in Utica reported an increase in business this fall due to larger orders for shot guns.

Charles L. Fenner, Utica, one of the founders of the Seneca Brass & Plating Workers of which he is treasurer for 20 years died this month.

The **Utica Drop Forge & Tool Company**, manufacturers of pliers and other tools, distributed in the United States and throughout the world, have filed two petitions on the Northern New York branch of Federal Court. One asked relief under the re-organization povision and the other asks permission to continue its own business. The papers show liabilities of $889,690, the greater part of which is $700,000 in capital stock. The assets are $631,750.—E. K. B.

Newark, N. J.

December 1, 1934.

Wilbur B. Driver, president of the **Gilby Wire Company**, Newark, announced upon his return from Europe the establishment of a new French Company to take over the European business of the Newark concern. The new **Gilby Wire Societe Anonyme** will be directed by **Gabriel Fodor**, formerly European manager of the Newark company.

After declaring the **Noxon Chemical Products Company**, of 70 Morris Avenue, bankrupt for a second time, **Federal Judge Guy L. Fake** has directed the concern's former general counsel and a former director, **George F. Seymour, Jr.**, to submit certain facts to the United States Attorney's office.

The old jewelry manufacturing plant of **Carter, Gough & Company** on Mulberry Street, located there since 1852, is being dismantled. The **Krementz Company**, has purchased the Carter concern's patent rights, dies, jewelry stock, selected tools and other equipment. The concern also supplied jobs for a number of employees of the old concern.

The following Newark concerns have been chartered: **Philip Cooper & Sons, Inc.**, metal products, 1,000 shares no par; **Winston's**, manufacturing jewelry, 2,500 shares no par; **Allison Laboratories, Inc.**, 1,000 shares no par.

C. A. L.

Trenton, N. J.

December 1, 1934.

Improvement is reported in some of the Trenton metal industry plants. Both the **Crescent Insulated Wire and Cable Company** and the **American Steel and Wire Company** are operating with night shifts. The **John A. Roebling's Sons Company** are having repairs made to a number of its factory buildings. The **Solfo Paint and Chemical Company** has established a factory and store on East State Street.

The following concerns have been incorporated here: **A. C. Kohl Electro Plating Company**, Jersey City, 1,000 shares no par; **Crown Point Products, Inc.**, spark plugs, Asbury Park, 2,500 shares no par; **Felco Faucet Corporation**, manufacture faucets, Jersey City, 1,000 shares no par; **Electric and Motors Corporation**, electrical devices, Jersey City, $75,000; **Max Poltersdorf, Inc.**, manufacture cutlery, Paterson, $10,000.

C. A. L.

Middle Western States

Detroit, Mich.

December 1, 1934.

Industrial leaders in all lines in this area are lining up for a tremendous drive in the interest of better things. Although it is early to forecast what the results may be, it is generally felt that something really is going to be accomplished.

It is probable that a month or more will pass before conditions actually will indicate a change. Nevertheless it looks as if the new year, so close at hand, will begin more auspiciously than the last.

Manufacturers of plumbers' and steam fitters' supplies are experiencing a slight revival.

Manufacturers of refrigerating and air conditioning units are in good production. This industry has made steady progress for a long time, and with air conditioning becoming more prominent, still greater activity is anticipated.

The **Norge Corporation,** at Muskegon Heights, Mich., is constructing two additions to its plant and will add two more smaller units within a short time, as well as other improvements, it is announced. The **Pyle Pattern and Manufacturing Company,** also of Muskegon Heights, reports more than normal employment at present due to the preparation of patterns for automobile and automotive parts manufacturers.

The **Ford Motor Company** which plans more than 1,000,000 cars during the coming year, announced recently a production program that will involve an expenditure of more than $415,000,000 a lot of money, as any one will admit. Of this sum, it is said, $300,000,000 will be spent with 1,757 suppliers in Michigan, of whom 1,390 have their plants in Detroit. The Fords expect to go into large-scale production some time in December, it is stated, and when in full swing it is estimated 87,000 men will be employed. At the height of production this year Ford employed 55,000 men at at Rouge and the Highland Park plants. The largest sum in the 1935 budget is $100,000,000 for bodies, to be spent almost entirely in Detroit. More than $2,650,000 will go for gray iron, exclusive of that produced at the Rouge plant. Other expenditures include $3,600,000 for copper; $1,443,000 for lead; $1,151,000 for tin; $337,750 for zinc. Announcement is made that all additional employment will go to former Ford workers or others residing in the Detroit area.

The **Excello Die Casting Company,** Grand Rapids, is now manufacturing zinc base alloy castings from two machines of its own design and manufacture. Others will be added, it is stated, at the rate of one a month until a full completement is reached. The company also has a design for a brass casting machine to be put into operation within the next six months.

A small factory building will be erected on East Larned Street, Detroit, by the **Detroit Name Plate and Etching Company,** it has been announced.

The **Hayes Body Corporation,** Grand Rapids, is anticipating a considerable increase in business in 1935, brought about by new and old contracts. **W. W. Hoagland,** president, announces that contracts have been made with the **Hupp Motor, Reo Motor, Willys-Overland, American Austin** and the **Kelvinator Corporation.** He anticipates that the 1935 business will increase 100 to 200 per cent over that of 1934. F. J. H.

Toledo, Ohio

December 1, 1934.

Industrial conditions have been dragging in this area for the last several weeks. Now with the seemingly early revival of the motor car industry, more enthusiasm is expressed and a number of accessory manufacturers are preparing for increased activities. Much is expected from the early months of the new year and plans are being made to maintain a more even production. Some plants already are retooling and making ready for activities they are expecting with the start of the new year.

The plating business has slowed materially, although some plants are in fair production.

David R. Wilson, receiver and president of the **Willys-Overland Company,** announces he expects more than 600 men will be recalled to work in the near future and the force eventually increased to 2,500 or more.

The **Cleveland Body** plant of the **Hupp Motor Car Company,** has been closed indefinitely, it is announced, and henceforth the corporation will purchase bodies from independent manufacturers. More than 400 men were employed at the Cleveland plant. Much of the machinery, it is stated, will be moved to Grand Rapids where it will be used by the **Hayes Body Corporation** for filling Hupmobile orders. **A. J. Brandt,** assistant general manager of the Hupmobile organization, said the reason for closing the Cleveland plant was that they were able to buy bodies cheaper than they could make them.

The **Electric Auto Lite Company,** Toledo, it is announced, has been awarded a long-term contract for all ignition requirements of the new Packard model soon to be introduced in the small-car field. F. J. H.

Pacific States

Los Angeles, Calif.

December 1, 1934.

The modernization of buildings and homes, has already resulted in an increased demand for copper, zinc, tin, brass and galvanized metal. A large force will be put to work here to get in contact with every householder and building owner.

The **United States Department of Commerce** have ordered twenty-five aviation engines built here by the **Menasco Manufacturing Company.**

The Dutch aviators who won a prize in the London to Australia race, used a **Douglas** plane made here at Santa Monica and now the Dutch backers have ordered more planes to cost $75,000. **Roscoe Turner** who won third prize used a **Boeing** made in Seattle.

The **Jahns Quality Pistons** here have bought out the **Motor Products Manufacturing Corporation.** The metal used in these pistons is an alloy of aluminum.

The **Reynolds Metal Company** of Louisville, Ky., had an exhibit here of metal containers and labels of gold and silver.

Hollywood Accessories is a new concern making a new fastener for ladies' clothes, and are running three 8 hour shifts; the product made of brass.

The **Universal Microphone Corporation** of Inglewood have developed a new radio set, which can be heard and spoken into, at the same time and in the same instrument.

The **Coast Oil Field Supply Company** are making new pump valves, for oil, water, used for the oil wells, etc.

The **Edward Katziner Company** is a new firm in production, making tinware, tools, and supplies for bakers and confectioners, at 4464 District Blvd. **Lloyd W. Sichel,** general manager.

The **Viber Company** will manufacture at 613 North Hewitt St., flexible and rigid electric vibrators.

The **National Engineering Company** have opened a factory at 1625 East 1st St., Santa Ana; **Charles Kaufman,** Superintendent.

The **Hollywood Jewelry Manufacturing Company** have started in business at the Grayco Bldg., 754 South Los Angeles St.; conducted by **Robinson** and **Constantine.**

The **Milan Brake Company** have started making a motor air brake at 3117 San Fernando Road.

The **Gates Battery Company** have started manufacturing at 5506 South Vermont Ave. H. S.

The North Pacific

December 1, 1934.

The **Atlas Imperial Diesel Engine Company** of Oakland have developed and are manufacturing a new type of Diesel engine for trucks and tractors.

The **Debler Products Company** of Worcester, Mass., **William J. Debler,** President, have established their oil burner factory formerly in the east, at Seattle, Wash., in charge of **W. W. Hallinan.**

The **United States Flexible Metallic Tubing Company** have moved to larger quarters at 512 1st Ave., South, Seattle.

The **National Motor Bearing Company** of 470 Natoma St., San Francisco, have bought the factory of the Victor Record Company, Oakland, and will move their factory to that location, making seals, shims, etc.; **A. S. Johnson,** President. H. S.

Metal Market Review

December 1, 1934.

Copper remained fixed at 9c throughout the month, but the background was not unsatisfactory. Figures were released showing that world stocks had decreased 23,000,000 pounds during October; also world production accounted for about 88,000 tons in October against 84,000 in September; domestic deliveries, 30,000 tons in October against 23,000 tons in September.

Informal discussions are being held toward the calling of another International Conference of Producers, to cut the output abroad.

American producers waived their quotas until Jan. 31, 1935.

Zinc slipped from 3.825 to 3.70. Buying increased toward the end of the month. The International Zinc Cartel will cease to exist on January 1st according to reports from abroad.

Tin was for practical purposes unchanged throughout, beginning at 51.15 going as high as 51.30 and ending at 51.20. Apparent world consumption for the year ending September, 1934, was 118,700 tons compared with 121,000 tons in the preceding twelve months. The downward trend exists in the United States, Germany and France. In other countries, the trend is approximately level except for Japan in which it is markedly upward. Apparent consumption in the United States was 47,786 tons for the year ending September, 1934, against 54,699 tons for the preceding twelve months.

Lead was also weak, slipping from 3.55 to 3.35. Buying increased, but largely as a result of the lower price. Stocks were reduced only 360 tons in October.

Aluminum was unchanged throughout at 22.

Nickel was also unchanged throughout at 35.

Antimony was consistently strong throughout the month, beginning at 10 and ending at 14. It seems to be in heavy demand abroad.

Silver again furnished most of the excitement, rising from 53c per ounce to as high as 57.75 and closing at 55. in November. The reaction was probably due to steady selling from China but the future is unpredictable, depending as it does to such a large extent upon Governmental manipulations. An interesting fact released by the American Bureau of Metal Statistics is that world output in October totalled only 14,795,000 ounces, compared with 14,974,000 in September and 15,481,000 in August. American production expanded to 2,099,000 ounces against 1,786,000 in September and 2,087,000 in August.

Platinum and **Gold** were unchanged at $34.00 and $35.00 per ounce respectively.

Scrap metals were on the weak side. Brass mill code prices on scrap alloys were cut from ⅛ to ¼c per pound during the latter part of the month. Brass ingot output has been slack and below the level of current deliveries. Secondary aluminum has been in fair demand but quieter.

Babbitt metal output according to the Bureau of Census 39 establishments totalled about 1,650,000 pounds in September against 1,856,000 in August and 2,420,000 in September, 1933. Production during the first nine months of 1934 totalled 19,600,000 against 17,300,000 in the same period of last year, and 13,000,000 in the same period of 1932.

Prices for non-ferrous ingot metals for the month ending November 2nd were as follows:

Commercial 80-10-10 (1½% Impurities)	9.806c
Commercial 78% Metal	7.718c
Commercial 81% Metal	7.751c
Commercial 83% Metal	8.023c
Commercial 85-5-5-5	8.278c
Commercial No. 1 Yellow Brass Ingot	6.507c

The Wrought Metal Market

November was quiet throughout. The seasonal (although late) rise in manufacturing operations improved the output of the mills, but the distribuors did not feel this uplift.

The American Brass Company announced on November 19 a reduction of ⅛ to ¼ cents in the base prices of rolled and drawn brass products as a result of the lower zinc prices. This new schedule became effective November 20th. The same company also allowed increased discounts for quantities for complete shipment at one time to one destination.

Daily Metal Prices for November, 1934

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	5	6*	7	8	9	12*	13	14	15	16	19
Copper c/lb. Duty 4 c/lb.													
Lake‡ (del. Conn. Producers' Prices)	9.125	9.125	9.125	....	9.125	9.125	9.125	....	9.125	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	9.00	9.00	9.00	....	9.00	9.00	9.00	....	9.00	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	7.25	7.25	7.25	....	7.25	7.375	7.375	....	7.50	7.50	7.50	7.50	7.50
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¼ c/lb.													
Prime Western (for Brass Special add 0.05)	3.825	3.825	3.75	....	3.75	3.75	3.75	....	3.75	3.75	3.75	3.75	3.725
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	51.15	51.125	51.125	....	51.25	51.35	51.30	....	51.30	51.20	51.20	51.20	51.10
Lead (f.o.b St. L.) c/lb. Duty 2½ c/lb.	3.55	3.55	3.50	....	3.45	3.45	3.45	....	3.45	3.45	3.45	3.40	3.35
Aluminum c/lb. Duty 4 c/lb.	22.00	22.00	22.00	....	22.00	22.00	22.00	....	22.00	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb.													
Electrolytic 99.9%	35.00	35.00	35.00	....	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	10.00	10.25	10.50	....	12.00	11.50	11.75	....	11.75	13.50	13.25	13.25	13.00
Silver c/oz. Troy, Duty Free	53.00	53.25	53.00	....	53.00	53.25	53.50	....	55.75	55.125	54.75	54.625	54.25
Platinum $/oz. Troy, Duty Free	34.00	34.00	34.00	....	34.00	34.00	34.00	....	34.00	34.00	34.00	34.00	34.00
Gold—Official Price‡ $/oz. Troy	35.00	35.00	35.00	....	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00	35.00

	20	21	22	23	26	27	28	29*	30	High	Low	Aver.
Copper c/lb. Duty 4 c/lb.												
Lake‡ (del. Conn. Producers' Prices)	9.125	9.125	9.125	9.125	9.125	9.125	9.125	....	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	9.00	9.00	9.00	9.00	9.00	9.00	9.00	....	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	7.50	7.50	7.50	7.50	7.50	7.25	7.25	....	7.25	7.50	7.00	7.289
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¼ c/lb.												
Prime Western (for Brass Special add 0.05)	3.725	3.70	3.675	3.70	3.675	3.70	3.70	....	3.70	3.825	3.675	3.732
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	51.15	51.25	51.25	51.20	51.25	51.25	51.375	....	51.20	51.375	51.10	51.222
Lead (f.o.b St. L.) c/lb. Duty 2½ c/lb.	3.35	3.35	3.35	3.35	3.35	3.35	3.35	....	3.35	3.55	3.35	3.417
Aluminum c/lb. Duty 4 c/lb.	22.00	22.00	22.00	22.00	22.00	22.00	22.00	....	22.00	22.00	22.00	22.00
Nickel c/lb. Duty 3 c/lb.												
Electrolytic 99.9%	35.00	35.00	35.00	35.00	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	13.00	13.00	13.00	13.00	13.00	13.00	13.75	....	14.00	14.00	10.00	12.382
Silver c/oz. Troy, Duty Free	54.00	54.50	54.875	55.125	54.875	55.125	55.25	....	55.00	55.75	53.00	54.255
Platinum $/oz. Troy, Duty Free	34.00	34.00	34.00	34.00	34.00	34.00	34.00	....	34.00	34.00	34.00	34.00
Gold—Official Price‡ $/oz. Troy	35.00	35.00	35.00	35.00	35.00	35.00	35.00	....	35.00	35.00	35.00	35.00

*Holiday.

Metal Prices, December 3, 1934

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 9.125, Electrolytic 9.00, Casting, 7.25.
Zinc: Prime Western, 3.70. Brass Special, 3.80.
Tin: Straits, 50.95. Pig 99%, 50.05.
Lead: 3.50. **Aluminum,** 22.00. **Antimony,** 14.00.
Nickel: Shot, 36. **Elec.,** 35.

Quicksilver: Flasks, 75 lbs., $74.00. **Bismuth,** $1.10.
Cadmium, 55. **Silver,** Troy oz., official price, N. Y., Dec. 4, 54.875c. **Gold:** oz., Troy, Official U. S. Treasury price Dec. 4, $35.00. **Scrap Gold,** 6¾c. per pennyweight per karat, dealers' quotation. **Platinum,** oz. Troy, $34.00.

Duties: Copper, 4c. lb.; zinc, 1¼c. lb.; tin, free, lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U. S. Import Duty	Import Tax*
Brass Ingots, Yellow	6½ to 8	None	4c. lb.[1]
Brass Ingots, Red	8¼ to 11	do	do
Bronze Ingots	9¾ to 12½	do	do
Aluminum Casting Alloys	15½ to 22	4c. lb.	None
Manganese Bronze Castings	20 to 34	45% a. v.	3c. lb.[2]
Manganese Bronze Forgings	26 to 38	do	do
Manganese Bronze Ingots	9 to 13	do	4c. lb.[1]
Manganese Copper, 30%	11½ to 16	25% a. v.	3c. lb.[2]
Monel Metal Shot or Block	28	do	None
Phosphor Bronze Ingots	10 to 12	None	4c. lb.[1]
Phosphor Copper, guaranteed 15%	13¼ to 15	3c. lb.[2]	do
Phosphor Copper, guaranteed 10%	11½ to 14	do	do
Phosphor Tin, no guarantee	61 to 75	None	None
Silicon Copper, 10%	18 to 30	45% a. v.	4c. lb.[1]
Iridium Platinum, 5%	$35-36.50	None	None
Iridium Platinum, 10%	$36-37.50	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:

	Cents lb.	U. S. Import Duty	U. S. Import Tax
Heavy copper and wire, mixed	6⅜ to 6⅝	Free	4c. per pound on copper content
Light copper	5½ to 5¾	Free	
Heavy yellow brass	3⅜ to 3⅝	Free	
Light brass	3 to 3⅛	Free	
No. 1 composition	4⅞ to 5⅛	Free	
Composition turnings	4⅝ to 4⅞	Free	
Heavy soft lead	3 to 3¼	2⅛c.lb.	None.
Old zinc	2¼ to 2⅜	1½c.lb.	
New zinc clips	2¾ to 3	1½c.lb.	
Aluminum clips (new, soft)	12¼ to 13¼	4c.lb.	
Scrap aluminum, cast	9¼ to 10	4c.lb.	
Aluminum borings—turnings	5 to 5½	4c.lb.	
No. 1 pewter	30 to 32	Free	
Electrotype or stereotype	2⅞ to 3	2⅛c. lb.*	
Nickel anodes	30 to 33	10%	
Nickel clips, new	31 to 33	10%	
Monel scrap	11 to 18½	10% a.v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since November 24, 1934. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	16c.	2½c. lb.
Bare wire, soft, less than carloads	12.75c.	25% a. v.
Seamless tubing	16.25c.	7c. lb.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	23.50c.	10% Quality	26.375c.
15% Quality	25.625c.	15% Quality	30.75c.
18% Quality	26.875c.	18% Quality	34.00c.

BRASS AND BRONZE MATERIAL

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	14¼c.	15¼c.	16	4c. lb.	U. S. Import Tax
Wire	14¾c.	15¾c.	16½	25%	
Rod	12¾c.	15¾c.	16⅜	4c. lb.	4c. lb. on copper content
Angles, channels	22¼c.	23½c.	24	12c. lb.	
Seamless tubing	16 c.	16¾c.	17⅝	8c. lb.	
Open seam tubing	22¼c.	23½c.	24	20% a. v.	No tax.

TOBIN BRONZE AND MUNTZ METAL

(Duty 4c. lb.; import tax 4c. lb. on copper content.)

Net base prices per pound.	
Tobin Bronze Rod	16¼c.
Muntz or Yellow Rectangular and other sheathing	17⅜c.
Muntz or Yellow Metal Rod	13¾c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.80
Aluminum coils, 24 ga., base price, tons lots, per lb.	30.50

ROLLED NICKEL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (Dec. 4) 56½c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' price)	10.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' price)	14.25	2c. lb.
Full Lead Sheet (base price)	7.00	2⅜c. lb.
Cut Lead Sheet (base price)	7.25	2⅜c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty Free)

This list applies to either block tin or No. 1 Brittannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Supply Prices on page 442.

Supply Prices, December 3, 1934

ANODES

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 500 lbs. or more, and subject to changes due to fluctuating metal markets.

Copper: Cast ..... 16½c. per lb.
Electrolytic, full size, 14c.; cut to size 14c. per lb.
Rolled oval, straight, 14½c.; curved, 15½c. per lb.
Brass: Cast ..... 14½c. per lb.
Zinc: Cast ..... 9c. per lb.
Nickel: 90-92% ..... 44c. per lb.
95-97% ..... 45c. per lb.
99%+cast, 47c.; rolled, depolarized, 48c.
Silver: Rolled silver anodes .999 fine were quoted Dec. 4, from 58c. per Troy ounce upward, depending upon quantity.

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.95/lb.	$2.65/lb.	$2.45/lb.
10-12-14 & 16	2 to 3½	2.85	2.55	2.35
6-8 & over 16	1 to 2	3.05	2.75	2.55
6-8 & over 16	2 to 3½	3.00	2.70	2.45
6 to 24	Under ½	4.25	3.95	3.75
6 to 24	½ to 1	3.95	3.65	3.45
6 to 24	Over 3½	3.35	3.05	2.85

Any Quantity

4 to 6	Under ½,	$5.00	½-1, $4.85	1 to 3,	$4.75
1½ to 4	"	5.55	" 5.40	"	5.35
1 to ½	"	5.85	" 5.70	"	5.60

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick. On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less were quoted July 2:

16" 20 ply 84/92 Unbleached	$86.21
14" 20 ply 84/92 Unbleached	66.06
12" 20 ply 84/92 Unbleached	49.63
16" 20 ply 80/92 Unbleached	71.02
14" 20 ply 80/92 Unbleached	54.50
12" 20 ply 80/92 Unbleached	41.04
16" 20 ply 64/68 Unbleached	63.43
14" 20 ply 64/68 Unbleached	48.73
12" 20 ply 64/68 Unbleached	36.75

⅛" Sewed Buffs, per lb., bleached or unbleached 49c. to 1.12

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.13½-.16
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 400 and 100 lb. drums, respectively		.15-.15¼
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl, drums	lb.	.13½-.14½
Denatured, drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.50-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	21½-23½
Chromic Sulphate, drums	lb.	.33-.55
Copper—Acetate (Verdigris)	lb.	.21
Carbonate, 53/55% cu., bbls.	lb.	.15-.16½
Cyanide (100 lb. kgs.)	lb.	.38-.40
Sulphate, tech., crystals, bbls.	lb.	4.55-5c.
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs.,	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.13½
Oxide (Litharge), bbls	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) 100% synth., drums	gal.	.42½
Nickel—Carbonate, dry, bbls.	lb.	.35-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.12-.13
Salts, double, 425 lb. bbls.	lb.	.12-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07½-.08⅝
Potassium—Bichromate, casks (crystals)	lb.	.08⅛
Carbonate, 96-98%	lb.	.08¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Gold Cyanide	oz.	$15.45*
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.08
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.48½
Cyanide, 100 oz. lots	oz.	.54
Nitrate, 100 ounce lots	oz.	.40½
Soda Ash, 58%, bbls.	lb.	.0252
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Beryllium fluoride ($2NaF.BeF_2$)	lb.	4.30-7.00
Gold Cyanide	oz.	$17.10*
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.55-3.70
Nitrate, tech., bbls.	lb.	.02¼
Phosphate, tribasic, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate, drums	lb.	.34-.37
Sulphocyanide, drums	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.38½
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11-.12
Cyanide (100 lb. kegs)	lb.	.37
Chloride, drums, bbls.	lb.	.07½-.10
Sulphate, bbls.	lb.	.033-.037

* Gold and silver products subject to fluctuations in metal prices.

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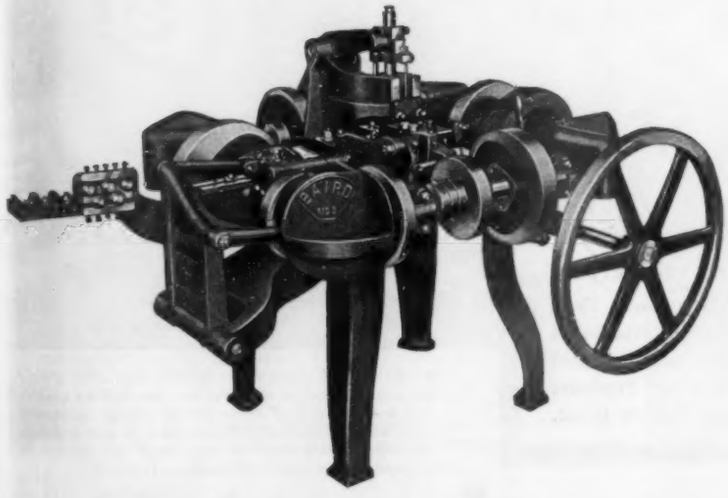

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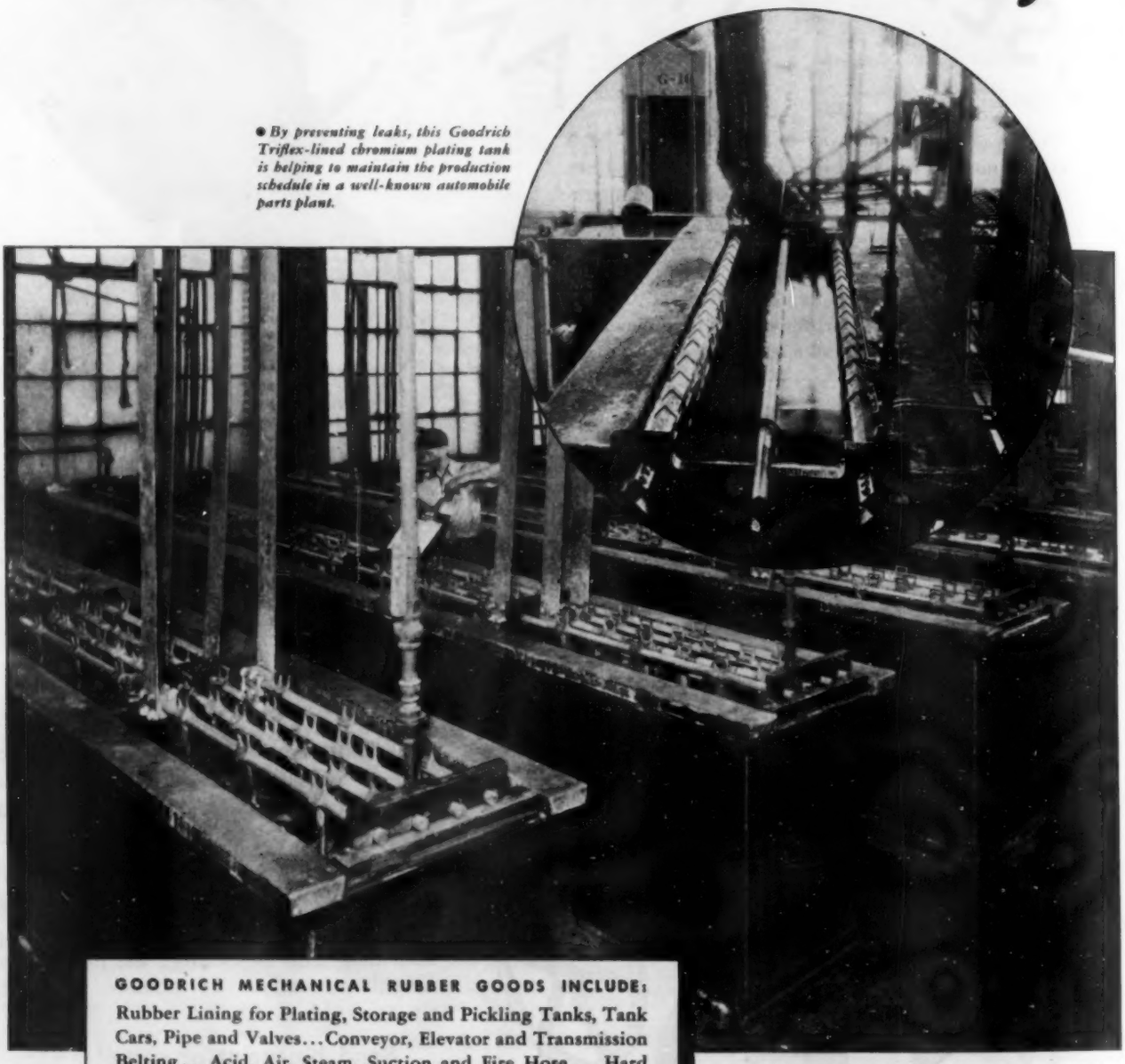


GOODRICH MECHANICAL RUBBER GOODS INCLUDE:
Rubber Lining for Plating, Storage and Pickling Tanks, Tank Cars, Pipe and Valves... Conveyor, Elevator and Transmission Belting... Acid, Air, Steam, Suction and Fire Hose... Hard Rubber Goods... Packing... Molded Rubber Products.... and a Complete Line of Miscellaneous Rubber Items.

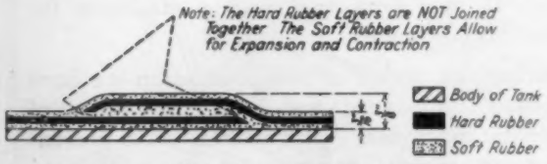
● *A battery of Vulcalock-lined plating tanks. One of their many advantages is that they may be repaired quickly and inexpensively if severe service should eventually cause a leak. Because the Vulcalock bond is acid resisting, the leak will be detected at once, for it will appear on the tank exactly opposite the leak in the lining.*

Goodrich

for plating tank troubles *is made of Triflex Rubber*

YOUR plating tank lining may have cracked, opened at the seams, wasted acid and electricity. Perhaps your plating solutions have been thrown out because of contamination by the lining material. Or your steel tanks ruined by tiny leaks, detected too late.

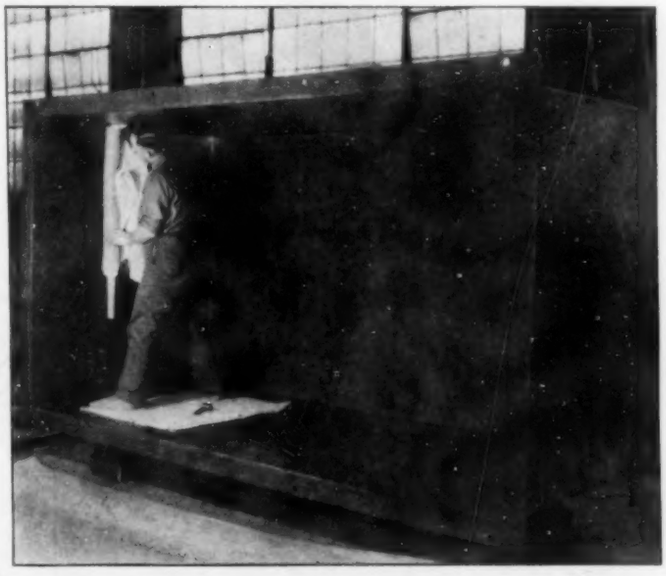
Gone are those days for every company which uses Triflex rubber tank linings. Triflex consists of a layer of hard rubber between two layers of soft rubber. The hard rubber, safeguarded against impact by soft rubber, will withstand acid, vapor and heat for years. Cracking or buckling is impossible because Triflex expansion joints provide for expansion and contraction during temperature extremes.


Note: The Hard Rubber Layers are NOT Joined Together The Soft Rubber Layers Allow for Expansion and Contraction
Body of Tank
Hard Rubber
Soft Rubber

● *Cross-section of the Triflex expansion joint used to overcome differences in contraction and expansion of steel and rubber.*

Triflex may be bonded inseparably to steel tank walls by the Goodrich Vulcalock Process which provides an adhesion of 500 to 700 lbs. per square inch. Acid cannot seep through and ruin the walls. And it is unnecessary to use fillers or pigments (which frequently contaminate plating solutions) to secure such an attachment. We are left free to adapt the pure gum rubber stock best suited to your needs.

Much more could be told about Triflex tank linings. In addition, they reduce and simplify repairs, increase production as much as 40%, reduce electricity bills—eliminate all avoidable plating costs. Goodrich engineers, plating tank specialists, are anxious to show you how Triflex tank linings can save you money. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio. (In Canada: Canadian Goodrich Co., Ltd., Kitchener, Ont.)



● *One operation in bonding rubber inseparably to metal by the Goodrich Vulcalock process.*

Rubber Lining

ALL *product problems* IN RUBBER

December, 1934

RUSH! SHIP TODAY! . . .

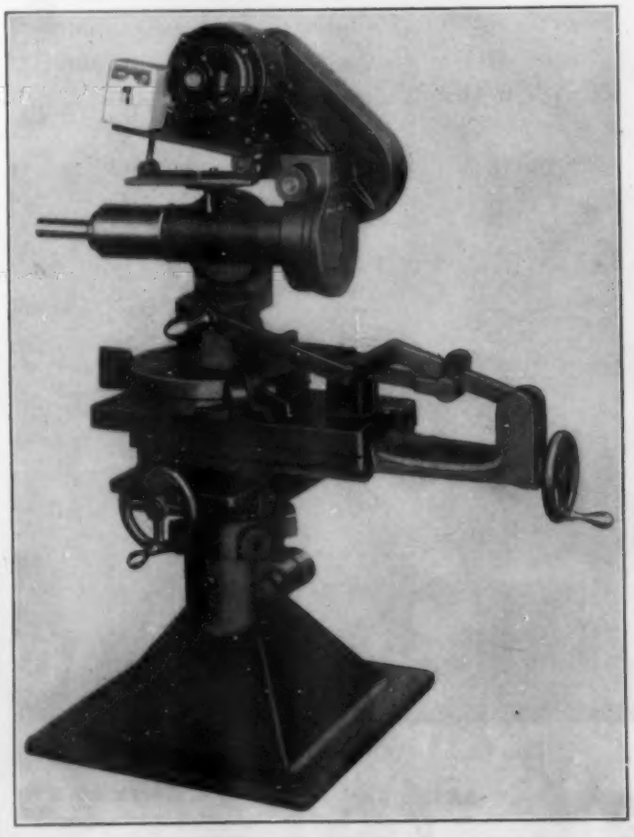
Over 65% of all orders are shipped
the day we receive them.
Three factories and large stocks
in fourteen warehouses is your
assurance of quick shipment
when you need it most.
When you must have plating
materials in a hurry,
send your order

HARSHAW QUALITY CHEMICALS

Anodes and salts for
Nickel, Copper, Chromium,
Cadmium, Tin, Zinc, Brass,
Bronze, Gold and Silver Plating.

TO . . . . . THE HARSHAW CHEMICAL CO.

Manufacturers, Importers, Merchants
Offices and Laboratories: Cleveland, O.
"Quality Products Since 1892"
New York, Philadelphia, Chicago, Detroit, Pittsburgh, Cincinnati, East Liverpool, Los Angeles, San Francisco
Plants at Cleveland, Philadelphia and Elyria



Acme Type "B-10"

ACME AUTOMATIC POLISHING AND BUFFING MACHINES

Increased production warrants the installation of ACME polishing and buffing machines for maximum efficiency.

During the period of low production we have improved, redesigned and built new types of automatic machines. This enables us to present equipment which economically meets the requirements of every practical production need in polishing and buffing.

Cut illustrates one of the improved single spindle machines equipped with ball and thrust bearings, V-belt drive, spring tension, swivel and quick pull-back toggle lever. This type machine is used in conjunction with the standard buffing lathe.

Send samples of your polishing or buffing problems today.

ACME MANUFACTURING CO.

1645 Howard St. Detroit

Builders of Acme Automatic Polishing and Buffing Equipment

LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA

LEA COMPOUND

Makes the Finishing of NICKEL SILVER* Less Costly

Reg. U. S. Tr. Mk.

LEA COMPOUND REDUCES COSTS

LEA Compound is a versatile composition. Its clean, fast-working properties apply about equally well to almost every kind of metal and to any shape of article.

Take Nickel Silver, for example, and these different articles: fan hub caps, pocketbook ornaments, table flatware, boxes, and flat sheets. Note that these articles have been subjected to different kinds of forming operations such as stamping, forging and rolling.

By changing over to LEA Compound, each of the shops making these Nickel Silver articles eliminated one or more of the following steps:

cutting down
tripoli buffing
color buffing
hand wiping
cleaning and drying

LEA Compound certainly is the versatile composition and it is entirely possible that you could make good use of it in your shop. Tell us about your work in detail when you place your trial order. There are several grades of LEA Compound, each best for certain classes of work.

*Nickel Silver is the fourth of a series of advertisements telling how LEA Compound reduces finishing costs. Others already mentioned are brass, aluminum, and stainless steel. No matter what metal or material you are working on ask us in what way LEA Compound can reduce your costs.

The Lea Mfg. Co.
Waterbury, Conn.

Specialists in the production of clean-working buffing and polishing compounds

LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA LEA

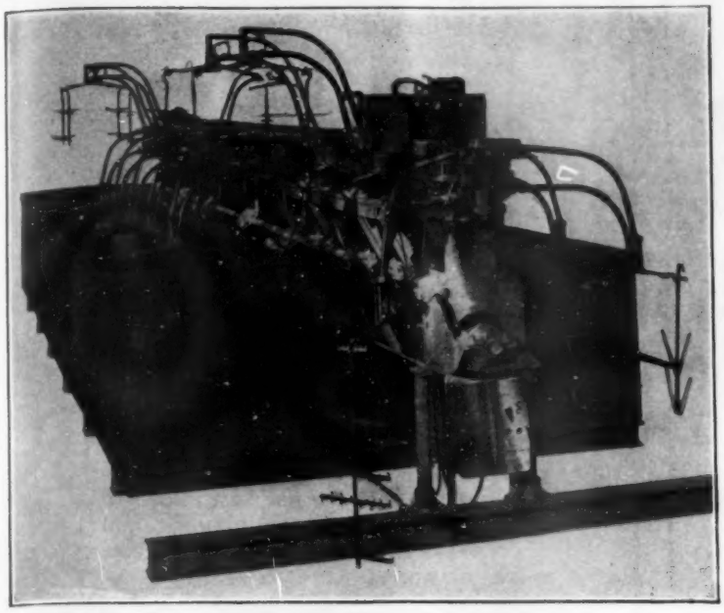
Wishing you a

Merry Christmas

and a

Happy New Year

United Chromium, Inc.
51 East 42nd Street • New York



Stevens

Return Type Full Automatic Plating Machine

A Universal Plating Machine adapted to any plating, cleaning or electro chemical operation.

We offer in this machine the greatest efficiency at a moderate cost. It requires the minimum of floor space and overhead clearance.

INEXPENSIVE—to own
—to install
—to operate

More than twenty of these machines are in daily service.

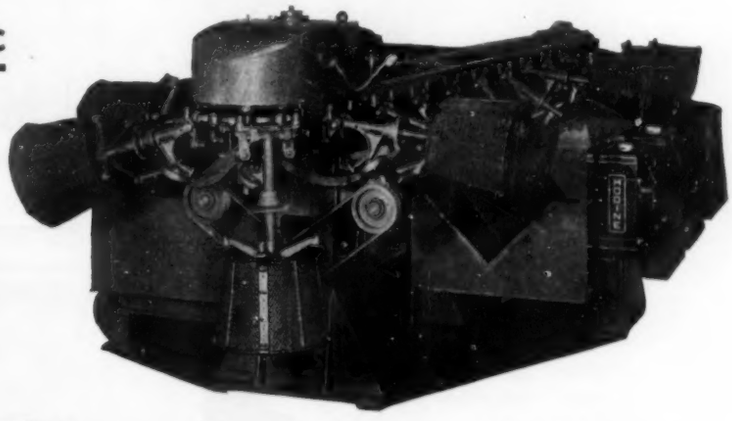
Return Type Full Automatic Barrel Plating Machine

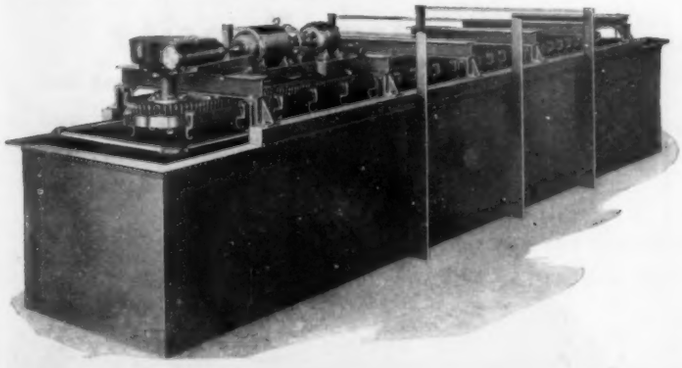
Small parts can now be plated at an absolute minimum of cost.

Illustration to the right shows the basket in the immediate foreground in vertical position ready to receive load. The unloading is entirely automatic.

The work is carried through any cleaning and plating sequence which may be specified.

Following the final rinsing operation there is a hot air dryer which completely dries the work.





Semi-Automatic Plating Machine

Where the volume of production will not warrant the installation of full automatic equipment, you can obtain the same high grade plating with this unit.

You save floor space and are assured of uniform work and reduced costs.

More than 50 of these machines are in daily service.

Frederic B. Stevens, Inc.

Detroit, Michigan

"More than a Half-Century of Progress"

NEW ENGLAND: 214 East St., New Haven, Conn. PENNSYLVANIA: 242 W. Twelfth St., Erie, Pa.
INDIANA: Hoosier Supply Co., 36 S. Cruse St., Indianapolis, Ind.
CANADA: Frederic B. Stevens of Canada, Ltd., 926 McDougall St., Windsor, Ont. . . . . 361 Sorauren Ave., Toronto, Ont.

Manufacturers of FOUNDRY FACINGS . . . . FOUNDRY SUPPLIES . . . . FOUNDRY EQUIPMENT . . . . BUFFING COMPOSITIONS . . . . POLISHERS' SUPPLIES . . . . POLISHERS' EQUIPMENT . . . . PLATERS' SUPPLIES . . . . PLATERS' EQUIPMENT . . . . AUTOMATIC PLATING MACHINERY . . . . Also FACE BRICK . . . . FIRE BRICK.

Belke

MANUFACTURING CO.

Patented Jan. 1925

Write for the 32-page Belke illustrated catalog.

Tips-Hooks-Racks

ARMORED IN HARDEST RUBBER AGAINST CURRENT LOSS, PLATING LOSS, ACID, SHOCK

By the exclusive Belke Process this Rubber Coat becomes a PART OF THE METAL —consequently, acid can not get behind it and between coat and metal.

Send sample or blue print of racks you are using or sample of articles to be racked, and we will promptly give you prices on Belke Rubber Armored Racks to fit your requirements.

947 N. Cicero Ave.

CHICAGO, ILL.

Christmas Greetings!

AS another year draws to a close, we extend to you our best wishes for the Christmas season and for the New Year.

We are appreciative of your friendship and of the patronage you have given us. We pledge our best efforts to make MATCHLESS COMPOSITIONS and MATCHLESS SERVICE of even greater value to you.

As the New Year advances may it bring you an increasing measure of prosperity and happiness.

The

Matchless Metal Polish Co.

840 W. 49th Pl. Chicago, Ill.

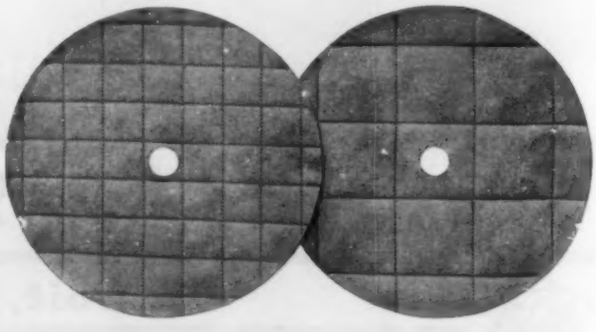
726 Bloomfield Ave. Glen Ridge, N. J.

YERGES BUFFS

"Taylor-Made"

Uniform Density

For all classes of work—from the hardest cutting to a soft color buff—there is a Yerges buff of uniform density especially made for the job. Full disc or pleated—stitched to special requirements at quantity prices. Write to:



Yerges Mfg. Co., Fremont, Ohio

REFININGS

HANDY & HARMAN
QUALITY SERVICE
FOUNDED 1867

VARIABLE VALUES

Sweeps, scrap, polishings, solutions and other waste have variable and unknown values. With increasing prices for precious metals, the variations are larger than ever in dollars and cents.

Refiners vary, too, measured in terms of ability, experience and reputation. Some stand higher than others—some are almost unknown.

Doesn't it stand to reason that valuable material of unknown value should only be put in the hands of refiners of known ability, experience and reputation?

Our trucks cover New England and Greater New York thoroughly every day.

Just send a post card or phone to our nearest branch and a truck will call.

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Phone—Beekman 3-2460

Principal Plant---Bridgeport, Conn.
Phone: Bridgeport 3-4143

Service Plant
425 Richmond Street,
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1896 1934

Extra wearing qualities increase production per wheel. Add reduced upkeep cost to these savings and you have the reason why

U.S.A. BRAND

U·S·A D

FELT POLISHING WHEELS

return full value for their first cost.

IF YOU DOUBT IT TEST THE WHEEL.

We manufacture all grades of

SHEET FELT

for

Rubbing, Buffing, Polishing and Mechanical purposes. In all Hardnesses.

The Felt that wears best.

EASTERN FELT COMPANY

manufacturers

Office and Factory

Canal St. Winchester, Mass. U. S. A.

AULT *WIBORG*

QUALITY FINISHES

Water Dip Lacquer
Tarnish Proof Silver Lacquer
Non Spotting Hardware Lacquer
Name Plate Lacquers & Enamels

Special Lacquers for Special Requirements

AULT & WIBORG CORPORATION

Factories—Cinn., Ohio

Offices—75 Varick St., N. Y. C.
1240 W. Wash. Blvd., Chicago

BRANCH OFFICES in the PRINCIPAL CITIES

COSTS UP? OR DOWN?

A MECHANICAL SELF-CLEARING

CIRCUIT MAIN APPLIED TO YOUR DUST COLLECTING SYSTEM,

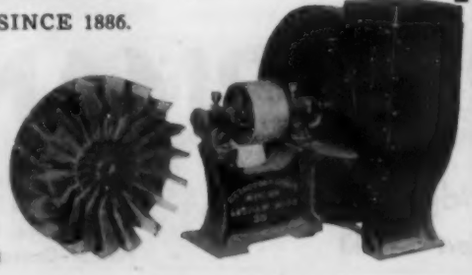
WILL SAVE POWER
GIVE YOU REAL FLEXIBILITY
ELIMINATE ALL FUTURE REMODELING

THE ALLINGTON & CURTIS MFG. CO.

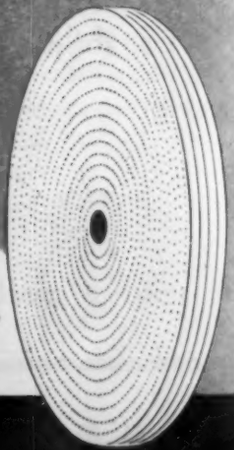
Factories: Saginaw, Mich. & Boston.

LEADERS SINCE 1886.

Use your present fans, collectors and discharge pipes, without even moving them.



HIGH GRADE COTTON BUFFS



WILLIAMSVILLE BUFF MFG. CO.
DANIELSON, CONN.

MECHANICAL PLATING EQUIPMENT

•

Modern production methods and the demand for higher quality plating makes it essential that Mechanical Equipment be used.

The Meaker Company is proud of its early pioneering of Mechanical Plating Equipment. More than twenty-five years ago we designed, built and operated continuous process plating machines which were marvels of operating efficiency.

Since bringing out these early types, the Meaker Organization has constantly occupied itself with development, improvements and research, always with the single aim, to produce and sell the best in Mechanical Plating Equipment.

The complete line of equipment now offered, we believe, will be found the last word in mechanical efficiency and will fulfill every plating requirement.

Let us show you how nicely a Meaker unit will fit into your manufacturing routine.

•

THE MEAKER COMPANY

1629-41 South 55th Avenue, (Cicero Station)

Chicago, Illinois

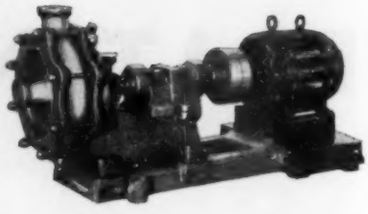
When it comes to filtering, you can't beat centrifugal pumps

BECAUSE, as the head builds up due to dirt in the filter cloths, the rate of filtration decreases. With positive displacement pumps, the capacity remains the same, meaning that dirt is forced through the mesh of the cloth and that the filter cloths wear out quickly.

With a centrifugal pump, only the solution that can pass through the cloth unhindered gets through. This means:

cleaner plating solutions; saving in filter cloths; less labor cost of replacement; lower cost of original equipment; the practicability of getting centrifugal pumps in abrasion-resisting as well as corrosion-resisting alloys.

The Duriron Company has much equipment on service of this kind—actual installations from which there has come a world of experience in filtration problems.



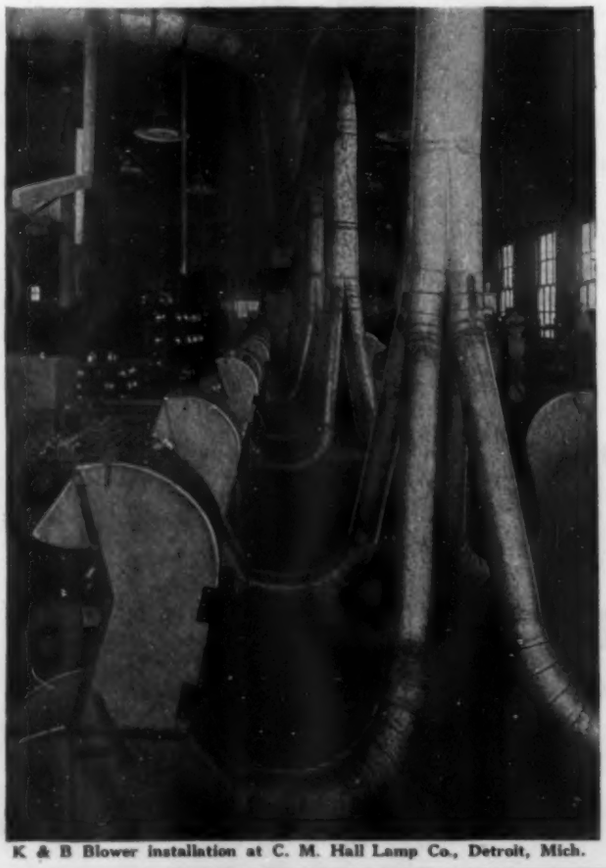
Duriron Co. Pumps are available in capacities from 10 g.p.m., to 1400 g.p.m., for heads up to 120 ft. and for satisfactory use with nearly all acids, including hot Muriatic Acid.

If you are not filtering your plating solutions, you are passing up an easy way to reduce costs and improve output.

If you are filtering, the Duriron man can give you some mighty good pointers that will prove beneficial.

THE DURIRON COMPANY, INC.

434 N. Findlay St., Dayton, Ohio



K & B Blower installation at C. M. Hall Lamp Co., Detroit, Mich.

Reduce Maintenance Costs with K & B Blower Systems!

K & B Dust Collecting and Exhaust Systems increase efficiency, improve working conditions, reduce operating and power costs.

Used and endorsed by many of the country's industrial leaders. We will tell you how you can remove dust or fumes efficiently and economically. Write

THE KIRK & BLUM MFG. CO.

2859 Spring Grove Ave., Cincinnati, Ohio

Detroit Factory: 4718 Burlingame

Pittsburgh Representative: The Bushnell Machinery Co., 1581 Grant Bldg. Louisville Representative: Liberty Blow Pipe Co., Inc., 325 Roland St.

THIS IS TO ADVISE THAT

E. I. DU PONT DE NEMOURS & CO., INC.,

has ownership or the American rights in the following patents covering broadly and specifically apparatus and process of degreasing materials with solvents:

U. S. Patents

1,816,895 1,869,826 1,869,845
1,875,937 1,904,450 1,905,968
1,907,875 1,911,926 1,925,602
1,938,841 1,961,867

In view of the possible interest of readers of this journal in this field, the du Pont Company believes all should be advised of the existence of the foregoing patents. The du Pont Company regards these patents as valid and as controlling the processes for degreasing materials with solvent vapors in various forms of containers, and consequently the Company is prepared to protect its rights under these patents.

DU PONT
REG. U. S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., INC.

The R. & H. Chemicals Department

WILMINGTON .·. DELAWARE

METAL METEX CLEANERS

A COMPOUND designed and perfected to successfully establish a chemically clean metal surface.

The true colloidal nature of the base keeps the extractive suspended and dispersed, thereby preventing redeposition.

Details will be gladly furnished regarding superiority of

METEX METAL CLEANER

MANUFACTURED BY

MACDERMID INCORPORATED

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COOPLAC LACQUER

Meets Every Plater's Need

For Appearance For Durability

COOPLAC COMBINED No. 9

Heavy body, high gloss
For brush, spray or dip
A paint. A lacquer. A varnish

COOPLAC WATER WHITE No. 82

For clear transparent film
For Dipping and Spraying

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Transparent

Ammonium Hydrosulphuret
Iron Nitrate
and a
Full Line of Platers Chemicals

In Cans 1 & 5 gal.

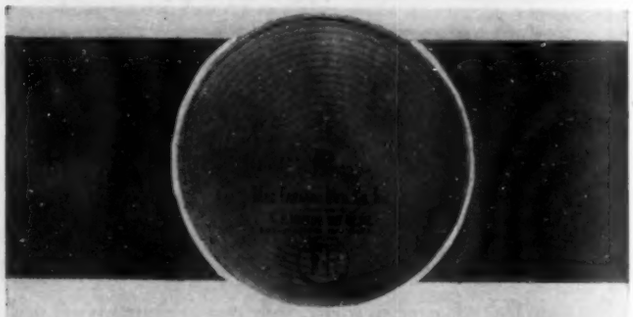
COOPER'S CERTIFIED CHEMICALS

In Drums 50 gal.

CHARLES COOPER & COMPANY

196 Worth St., New York, N. Y.

Works, Newark, N. J. Established 1857



MAC FARLAND BUFFS

MAC FARLAND MANUFACTURING CO. INC.

21-03 41st AVENUE LONG ISLAND CITY, N. Y.

METSO SAVES TIME

COURTESY PHILA. STORAGE BATTERY CO.

ARE YOU troubled with frequent dumping of cleaner baths? Let Metso's active sustained strength increase their working life.

Metso, sodium metasilicate has the high alkali content that acts quickly on greases, oils, buffing and polishing compounds. In some plants, it has reduced cleaning time a third.

Metso can help you, too. Give it a trial.

PHILADELPHIA QUARTZ COMPANY

General Offices and Laboratory: 125 S. Third St., Phila., Pa.
Chicago Sales Office: 205 W. Wacker Drive. Stocks in 60 cities.
Sold in Canada by National Silicates Ltd., Toronto, Ontario.

Metso Detergents Pat. Nos. 1898707 and 1948730.

Hexagonal Burnishing Compartment
24" side to side, 12" deep

A New IDEAL Barrel

—for burnishing small batches

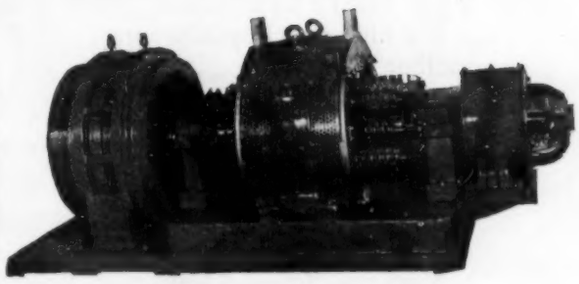
Loaded through small side door for small work or by removal of tight-locking head plate for large pieces, this barrel automatically transfers balls from storage behind the perforated plate to burnishing compartment. Balls and work may be rinsed while in barrel. Reversal of barrel (and tilting it up) automatically separates balls from work, quickly and completely. This elimination of manual ball handling speeds production, reduces labor, cuts cost.

Barrel furnished with wood or ¼-in. abrasion-resisting rubber lining.

N. Ransohoff, Inc.

West 71st Street at Millcreek, Carthage, Cincinnati, Ohio

PLATING GENERATORS OF QUALITY



EFFICIENT MODERN DESIGN

BALL BEARING INTERPOLE

●

COMPLETE PLANT EQUIPMENT

TANKS—TANK RHEOSTATS—SWITCHBOARDS—AGITATORS—BUS BARS etc.

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CHAS. J. BOGUE ELECTRIC CO.
HOBOKEN, N. J.

EST. 42 YEARS

CABLE ADDRESS—MACHELECT

Besplate
NICKEL ANODES

ARE QUALITY PRODUCTS • • •

LEADERS in the Nickel Plating Industry have standardized on McGean Besplate 99% Nickel Anodes — Because

1. Cathode Deposits are smoother
2. Anode corrosion is excellent
3. Less frequent filtering of solution required

◆◆◆◆◆

We Also Offer
Genuine Rolled Oval
Depolarized Nickel Anodes

◆◆◆◆◆

From our complete line of Anodes and Plating Chemicals we call your attention to the following:

ANODES

Nickel (all percentages)	Tin
Copper	Brass
Cadmium	Zinc

CHEMICALS

Nickel Salts	Copper Sulphate
Nickel Chloride	Copper Cyanide
Nickel Carbonate	Copper Carbonate
Chromic Acid	Cadmium Oxide

Manufactured by

THE McGEAN CHEMICAL COMPANY
CLEVELAND, OHIO

Main Office	*Factory*
B. F. Keith Bldg.	2910 Harvard Ave.
Cleveland, Ohio	Cleveland, Ohio

McGEAN CHEMICALS

Characteristics of & Uses for STEEL SALES SILVER SOLDERS

• • •

SILVER SOLDERS have a constantly widening range of uses in brazing copper, brass, bronze, extruded brass and bronze, steel, stainless steel, nickel silver, and various alloys or special metals having melting points of 1400° F. or above.

Silver solders are extremely free flowing. They penetrate quickly and alloy with the metals being joined, making sound, strong joints, resistant to shock and vibration and to corrosion.

Often Less Expensive than the Cheapest "Welding Rod"

Though the cost per ounce of silver solders is necessarily higher than that of the all-base-metal alloys, the cost of "Silver brazing" per joint, is frequently lower than by any other method. This, for several reasons:

1. A small amount of silver solder makes a stronger, tighter joint than a clumsy mass of the more sluggish brazing metals. (Silver-brazed butt joints show barely a "hairline.")
2. Greater speed of operation and lower torch temperatures effect a marked saving in gas and labor time both in brazing and cleaning after the joint has been made.
3. The greater certainty of sound silver-brazed joints avoids the cost of "remakes" in the plant, and rejections by customers.

Low Brazing Temperatures

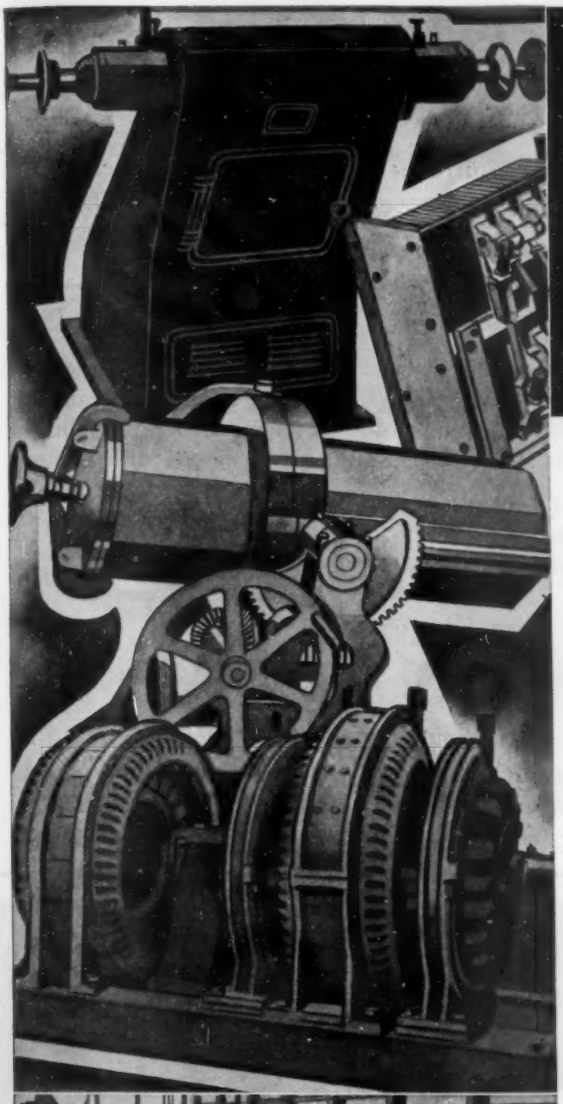
Melting temperatures for Steel Sales Silver Solders range from 1175° F. to 1600° F., which is anywhere from 400° F. to 800° F. lower than the melting points of brass, bronze and other brazing metals containing no silver.

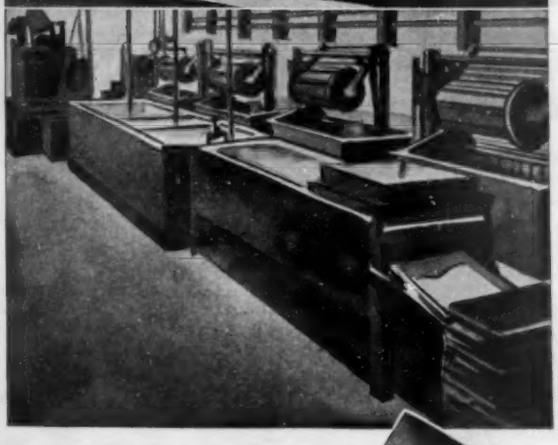
Send for our Silver Solder Bulletin which gives detailed information about Steel Sales Silver Solder. We will be glad to offer advice on any brazing problem.

• •

STEEL SALES CORPORATION

129 S. Jefferson St. Chicago, Ill.
4150 St. James St. Detroit, Mich.





GRASSELLI

OFFERS

MODERN PLATING ROOM EQUIPMENT
SUPERVISED INSTALLATION
COMPLETE ENGINEERING SERVICE

WHATEVER your needs, whether it be complete plating room equipment, Cadmium anodes or acid, we can readily fill your requirements. Plating apparatus selected on the basis of efficiency, economy and years of experience.

This complete service is gladly given you by Grasselli experts, cooperating with you for the success of your Electro plating.

This is but one reason why the Cadalyte Process, an exclusive Grasselli method of depositing pure metallic Cadmium on iron or steel, lowers cost and reduces plating time.

CADALYTE

A Process and Product for Cadmium Plating

THE GRASSELLI CHEMICAL COMPANY
FOUNDED 1839 INCORPORATED **CLEVELAND, OHIO**

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The Grasselli Chemical Company, Plating Department
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Send Cadalyte Booklet and specific information on plating room equipment.

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With this Sand Blast Outfit You Can . . .

1. *Give an even, always uniform finish to your product.*
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Whether you are interested in mat, frosted, or satin finish on metals, glass, or compositions—or in putting a plating, enamel, galvanized paint or japanned finish on your product, you will find a Leiman Bros. Sand Blast Outfit a dependable and money saving unit to use.

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Removing insoluble dirt, carbon smut, finger prints, and similar deposits need no longer be a troublesome, time-consuming operation.

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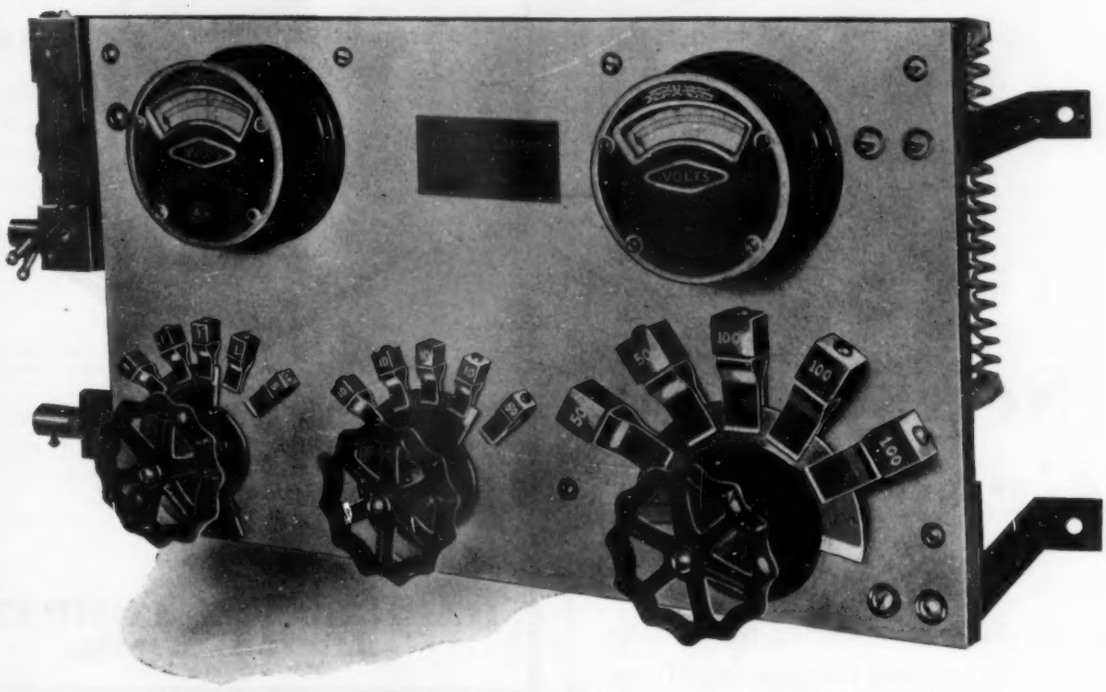
- ☐ Cleaning before plating, tinning, painting
- ☐ Cleaning aluminum, tin, zinc
- ☐ Washing waste and wiping cloths
- ☐ Anti-rusting parts for stock, between operations, etc.
- ☐ Cutting, Grinding, Stamping and Drawing Compounds.

INDUSTRY'S ACCEPTED STANDARD OF CLEANING SINCE 1909

The BELKE



500 Ampere Rheostat Style B.V.A.—Illustration shows 443 Amperes in operation.

A NEW Rheostat years in advance of anything on the market.

The Belke Rheostat is a finished product and stands out in front of all others.

Beautiful machine work thru-out and made as a Rheostat should be made.

The resistance wires are held securely in place by a single nut and collars. Remove the nut and they can be taken apart in an instant for cleaning.

ADVANTAGES

INDIVIDUAL Ampere Regulation (From 1 to 10,000). A single turn of a handle does the work of 5 knife switches.

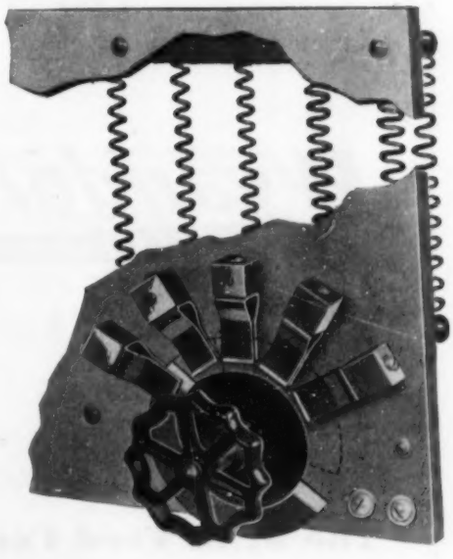
Resistance wires are all in parallel the same as other knife switches.

All contacts are under spring pressure and are self-cleaning.

BELKE Rheostats are exceedingly precise.

Quality is the main thought that is born in mind throughout the construction.

If you are considering a new Rheostat, write us today. Quotations are cheerfully furnished.



One accurately machined knife disc does the same work by passing thru the blades as 5 knife switches.

BELKE MFG. Co.

947 N. Cicero Ave. Chicago, Ill.

Season's Greetings

North or South, East or West,—wherever you may be during the holiday season, we again send you greetings from the home of the Wyandotte Indian. May the New Year bring you a fuller share of contentment and prosperity and as much genuine pleasure in all your business relationships as we have felt in our relationship with you!

Wyandotte
Clean "Chemically" Clean
Metal Cleaners

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Wyandotte, Michigan

Polishers of Stainless Steel!

Polishers of Chrome!!

The House of Quality

Buffing and Polishing Compounds that will give you satisfaction.

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Imperial Multiple Compartment Polishing Machines are made to withstand production strains. These machines positively cut polishing costs. Our machines are made in sizes from two to six compartments. Unequalled for the manufacturer who wishes to polish a number of different kinds of small parts at one time and keep each kind separate. We make seven stock sizes of this machine and can build them in special sizes if requested. We also build several sizes of single compartment machines and carry a complete stock of steel balls, cones, spickets and soap powder for burnishing purposes.

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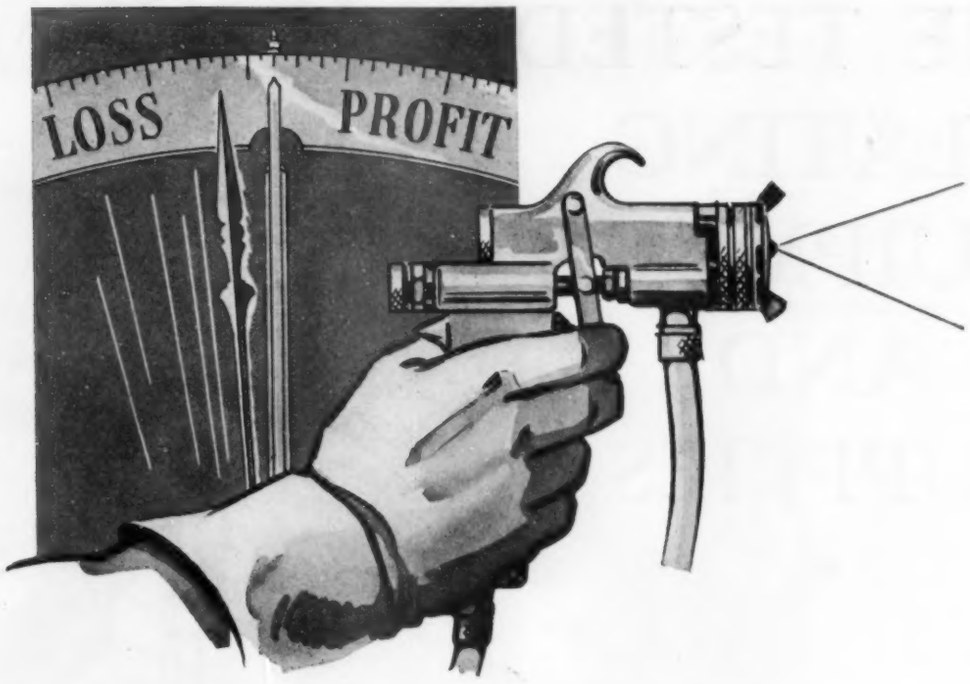

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WE DO not claim to be miracle workers. But when hundreds of Egyptian users report healthy sales increases and lowered finishing costs—the ability of Egyptian Finishes to shift the scales from loss to gain is rather convincingly demonstrated.

That a new day in product finishing is here no one with half an eye can doubt. A product may be finely constructed and mechanically perfect —and still be a veritable *wallflower*. While an inferior competitive product waltzes away with *Sales* because it is surrounded with glamour and selling appeal—because it is smartly finished. It's discouraging, but true, that even the finest product will be ignored if the customers can't "see" it.

Let Egyptian help you choose a new "dress" for your product—a finish that will immediately attract the roving eyes of the buyers; one that will be a profit-maker.

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TIME TESTED PLATING EQUIPMENT AND SUPPLIES

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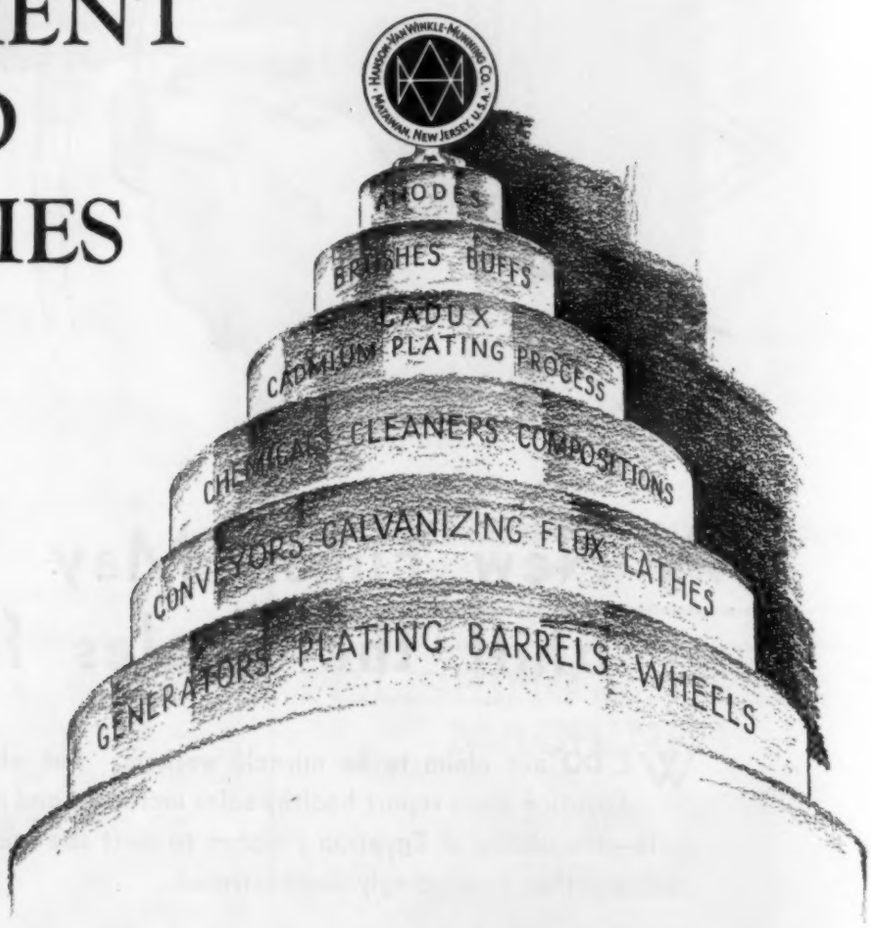


No experiment here. Every item mentioned in the list has received the approval of platers for years—some of them for scores of years.

In each line there are several kinds, grades and prices. But for each of your plating problems there is only one combination of equipment and supplies that will give the highest quality plating at the lowest cost. We would like to help you find the combination of Hanson-Van Winkle-Munning Products that will give the best results on your work.

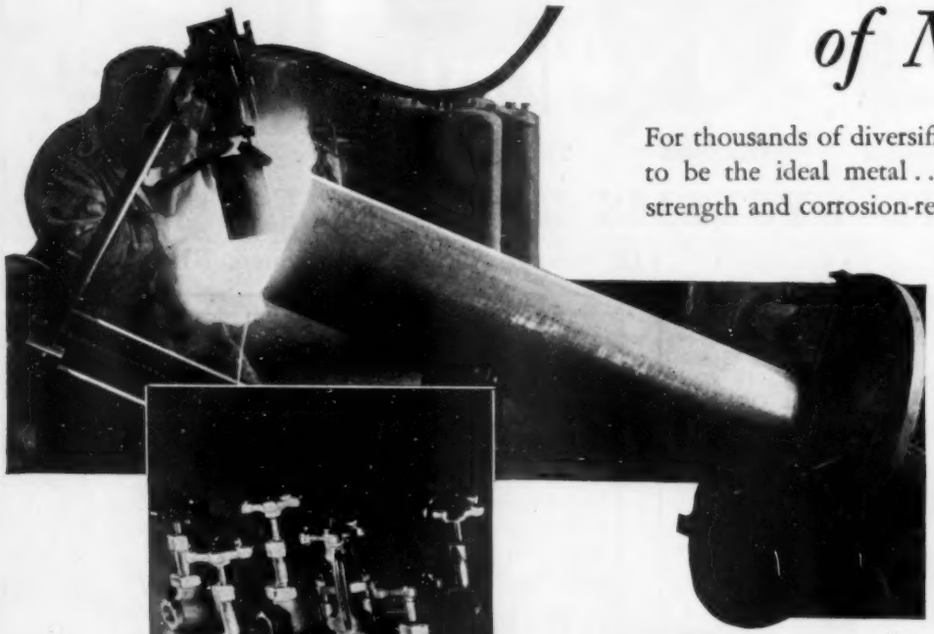
HANSON-VAN WINKLE-MUNNING

HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, N.J.

638

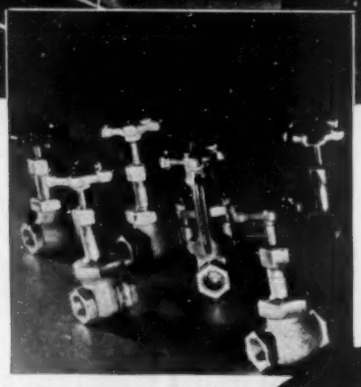
December, 1934

EVERDUR...*Modern Metal of Many Uses*



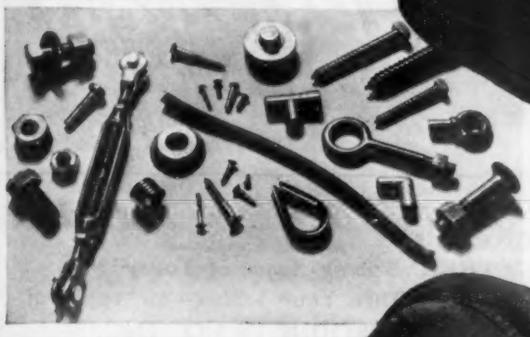
For thousands of diversified uses, Everdur has proved to be the ideal metal . . . because it combines high strength and corrosion-resistance with ductility, weldability, workability and moderate price.

"Everdur" is a registered trade-mark identifying products of The American Brass Company made from alloys of copper, silicon and other elements. Additional information upon request.



Above—Carbon arc welding an Everdur storage tank bottom into a seamless drawn Everdur shell. (Seamless shells and tubes available up to 26" I.D.)

Above—Cast Everdur valves for severe service. Everdur ingots are used for a wide variety of dense close-grained castings—made with the regular equipment of brass and bronze foundries.



At left—Excellent resistance to dilute sulphuric acid, plus high strength and good fabricating qualities, makes Everdur ideal for smoke washers.

Below—Spun sheet Everdur. No end to the adaptability of this high-strength copper-alloy!

Above—Here we have forgings, die-pressings, machined parts, rolled parts and flexible metal tubing. Name the part you need. Then investigate the possibilities of Everdur!

At right—Riveted Everdur digester for process work—8′ in diameter. Everdur vessels of all types and sizes are put to endless uses.

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from mine to consumer

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn.

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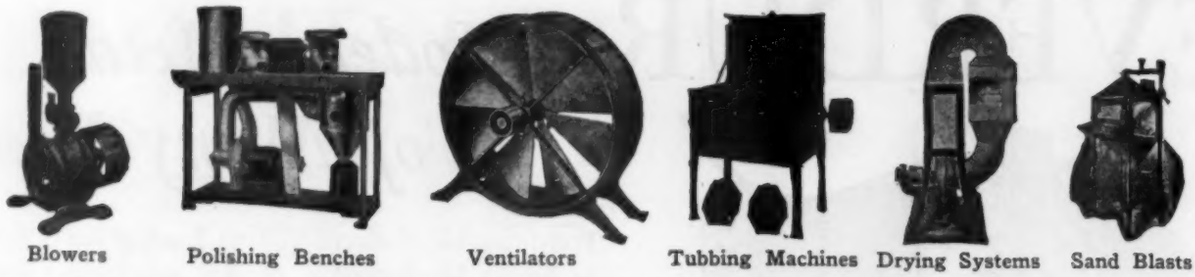
December, 1934



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PERMAG TRIPOLI REMOVER

This compound removes Tripoli from brass without tarnishing.

To appreciate its extraordinary effectiveness, test it in your own plant under actual working conditions.

Every brass fabricator who has tried PERMAG Tripoli Remover, has adopted it immediately.

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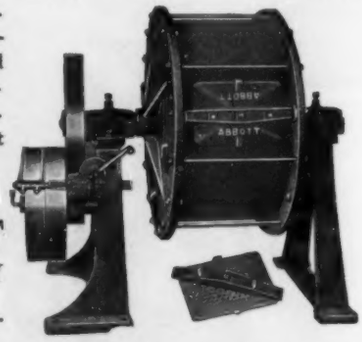
FINISH PECKS instead of *PIECES*

Investigate this low-cost, efficient method of polishing small metal parts in Abbott Burnishing Barrels with Abbott Materials.



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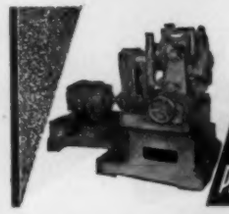

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Centerless feed machines for cylindrical work, Conveyor feed for flat work and Hand operated for misc. Great producers and labor savers.
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"THE Oxidizing Agent of Today"
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Available in all gauges, sizes, and tempers; and in bright or satin finish.

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Your request for samples and further information will have immediate attention.

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In gauges .001 and thicker—1/16" to 16" wide

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For Nickel, Brass, Copper, Cadmium, Silver and Chrome solutions. Capacities 300 to 2400 gallons per hour. Write for prices.

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THE VULCAN DETINNING CO.
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FOR TIN ELECTROPLATING
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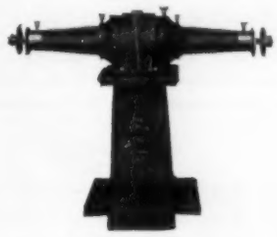

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We also have to offer

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Will Quote Attractive Price

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In addition, we have a large assortment of small plating generators, motors, blowers, motor generator sets, etc.

EVERYTHING SOLD THRU US IS GUARANTEED

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All Moreco Rebuilt platers are completely overhauled and fully tested under overload conditions.

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150	5	Crocker Wheeler
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300	6	Optimus
350	6	Bennett O'Connell
500	6	Z. L. & L.
600/300	6/12	Giant
1000/500	6/12	Chromar
1500/750	6/12	Connecticut
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Any machine can be furnished with direct connected motor drive for AC or DC. Write. Wire. Phone for prices.

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Value about $140. Will sell for $25 F. O. B., Kalamazoo, Mich.

OTTO GERLINE
Gerline Brass Foundry Company
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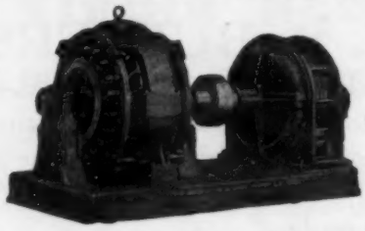
POLISHING AND PLATING EQUIPMENT

Plating Dynamos and Motor Generator Sets



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Tumbling and Plating Barrels and most anything for the Plating Shop.

Largest Stock of Used Polishing and Plating Supplies in America

Let us have your requirements. Entire plants or parts thereof bought for cash. Send us list with prices.

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Wanted—Equipment and Supplies.

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We are paying special prices for any quantity of scrap.

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Discarded plating room scrap of all kinds.

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Display Advertisements, One Column Wide, $1 per inch, Each Insertion

Foreman Plater

Situation Wanted—By a foreman plater who desires to connect with a reliable firm where the services of a competent man is indispensable, and where executive ability and chemical control in the finishing and plating departments is essential. Am qualified by years of practical experience in large and small shops and with an intimate technical knowledge of all standard and special solutions. Am thoroughly familiar with modern practice and developments in the deposition of chromium, cadmium, gold, silver, nickel, black nickel, brass, bronze, copper, zinc and tin plating upon ferrous and non-ferrous metals by the full automatic, semi-automatic, still tank and mechanical barrel processes, also the anodic oxidization of aluminum, rust-proofing steel, oxidizing, lacquering and ball burnishing. The applicant has initiative and is a man of good judgment in both the handling of help as well as material. A permanent position with a dependable concern would be appreciated more than a large salary. Location unimportant. Excellent references submitted.

Address Anodic, care of Metal Industry

FOREMAN PLATER

Situation Wanted: By a foreman plater who is accustomed in producing only the highest quality of results by modern developments in the deposition of all metals, on production as well as on special work by the Automatic, Mechanical or Still tank methods.

The production of finishes in all its up to date colors and shades by chemical and oxidizing processes including fire or Mercury Gold and real Verde Antique. Including Lacquer Enamel finishes by the spray method.

Combined with a sound knowledge in analytical chemistry permitting the actual control of the solution and maintaining normal conditions.

Past experience covers Hardware, chandelier, electric appliances, Automobile, Silver Tableware, Bronze doors and panels and other products.

Past experience with piece work and thoroughly understand the handling of help. Desires a permanent connection with a reliable concern which would be more desirable than large salary. Can furnish best of references. Location unimportant.

Tableware, Care of Metal Industry

PRACTICAL CHEMIST

Young man, 4 years experience as a plater. Can analyze and make up own plating solutions. Can get results in a practical way. Clean cut, aggressive and willing to work hard for advancement.

P. L., care of Metal Industry.

FOUNDRY FOREMAN

Experienced in all kinds of non-ferrous operations; 35 years old. First-rate references. Any location.

Experience, care of Metal Industry.

SITUATION WANTED—By young man, graduate of an excellent technological school, who has experience in production plating, and analysis and control of cleaning, pickling and plating solutions. Now employed as sub-foreman of small plating plant. Producer. Excellent references.

Address F.M.B., care of Metal Industry.

FOREMAN PLATER

Situation Wanted—Foreman Plater with 20 years experience. Expert in all solutions. Ample experience in job shops and manufacturing experience hotel silverware, lamps, plumbing supplies.

S. W., care of Metal Industry.

PLATERS' GUIDEBOOK

1934-1935—SOLUTIONS EDITION

By

OLIVER J. SIZELOVE

WE WILL SEND YOU ONE UPON RECEIPT OF ATTACHED COUPON PROPERLY EXECUTED

METAL INDUSTRY, 116 JOHN STREET, NEW YORK

Name .....

Street .....

City .....

and State .....

If you please!

In order that we may properly classify your subscription, please indicate below (with an X) all of the departments operated at your works.

☐ Cleaning ☐ Lacquering ☐ Coloring
☐ Plating ☐ Buffing ☐ Finishing
☐ Japanning ☐ Polishing ☐ Grinding

Platers' Guidebook. Fourth Edition—1934-1935, by Oliver J. Sizelove, Associate Editor of **Metal Industry.** Published by The Metal Industry Publishing Company, 116 John Street, New York. Size 5 x 8; 48 pages. Price 10 cents; free to subscribers of **Metal Industry** and **Platers' Guide.**

This is the fourth (revised solutions) edition of a booklet originally published in 1930. In its first three editions 38,000 copies have been distributed. It is put up as a handy pocket reference book for the plater, foreman, superintendent and chemist, for use in the plant in such form that it can be carried about conveniently. Its material is essentially practical in character, but it also includes a considerable amount of information on the technical aspects of plating operations, such as solution control by analysis, etc.

The best description of this booklet is a summary of the table of contents: Polishing Metals; Metal Cleaning; Solution Formulae for Nickel, Copper, Brass, Bronze, Zinc, Tin, Chromium, Cadmium, Lead, Iron, Silver and Gold; Metal Coloring; Analyses of Plating Solutions; Determining the pH of Nickel Solutions; List of Chemicals with their Common Names and Physical Properties used in the Electroplating and Metal Finishing Industry.

It is clear from the above list that the new edition will be considerably broader in scope than the one which preceded it. It is asked that requests for copies be sent on the stationery or letter-head of the firm.

from a laboratory phenomenon to a commercial reality....

99.99+% ZINC

Cell Room of Reduction Plant, Silver King, Idaho

High purity zinc became a reality with the appearance of the Bunker Hill brand in the fall of 1928. Since that time the special electrolytic process developed to produce this grade of zinc has been steadily improved and today Bunker Hill metal runs over 99.9975% pure.

That a need existed for zinc of this purity, is evidenced by the fact that "four nines" metal has been adopted as standard for all zinc base die-casting. Bunker Hill Zinc revolutionized the die-casting industry. It made possible zinc die-castings with tensile strengths of 45,000 lbs. p. s. i. and better. Elongations were increased 33% over those obtained with the old zinc as a base.

Impact strengths of 12 foot pounds are now obtainable, an increase of 50 to 100% over the old alloys. When artificially aged in steam tests, these new alloys retain their strength and show very low dimensional changes as compared to the alloys made with the old 99.90 zinc as a base.

Considering the improvements in die-casting obtained by changing from "three nines" to "four nines" in the zinc base, it is not unlikely that the increase in purity from four nines to 99.9975 will result in further improvements in the physical properties of zinc base die-castings.

ST. JOSEPH LEAD COMPANY, 250 PARK AVENUE, NEW YORK

BUNKER HILL ZINC

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 40*

ABRASIVES (Also see Emery)

Artificial

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Emery

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Stevens, Inc., Frederic, B., Detroit, Mich.

ACID PIPE

American Hard Rubber Co., New York, N. Y.
Belke Mfg. Co., Chicago, Ill.

ACID PROOF PIPE

Resistance, Hard Rubber

Belke Mfg. Co., Chicago, Ill.
General Ceramics Co., New York.
The B. F. Goodrich Rubber Co., Akron, Ohio.
U. S. Rubber Co., New York.

ACIDITY TESTING APPARATUS (Inquire)

Metal Industry, New York.

ACIDS

Boracic

Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

Chromic

Chas. Cooper & Co., New York.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.

Hydrofluoric

General Chemical Co., Philadelphia, Pa.
Harshaw Chemical Co., The, Cleveland, Ohio.

Oil of Vitriol (Sulphuric)

Zapon Co., The, New York, N. Y.

AEROPLANE DOPE

Egyptian Lacquer Mfg. Co., New York.
Zapon Co., The, New York, N. Y.

AGITATORS FOR PLATING SOLUTIONS

Belke Mfg. Co., Chicago, Ill.

Mechanical

Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

AIR FILTERS

Kirk & Blum Mfg. Co., Cincinnati, Ohio.

ALLOYS (See also Kind Wated.)

Non-Ferrous

Seymour Mfg. Co., Seymour, Conn.

Brass, Bronze, Nickel, Silver

Seymour Mfg. Co., Seymour, Conn.

ALUMINUM (See Ingots, Sheets, Wire Rods, etc.)

Sheet

British Aluminium Co., Ltd., The, New York.
Strahs Aluminum Co., New York.

ALUMINUM CLEANER

Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.

ALUMINUM INGOT

British Aluminium Co., Ltd., The, New York.

AMMETERS (See also Electrical Apparatus and Equipment.)

Hanson-Van Winkle-Munning Co., Matawan, N. J.

AMYL ACETATE

Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon Co., The, New York, N. Y.

ANNEALING FURNACES

Electric

Oil or Gas

Monarch Engineering & Mfg. Co., Baltimore, Md.

ANODES

All Metals

Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

Brass and Bronze

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid Incorporated, Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Seymour Mfg. Co., Seymour, Conn.

Cadmium

du Pont de Nemours & Co., E. I. Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

Copper

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid Incorporated, Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.

Lead

Harshaw Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

Nickel

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid Incorporated, Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

Tin

Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

Zinc

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
McGean Chemical Co., The, Cleveland, Ohio.

AUTOMATIC METAL CLEANING MACHINES

N. Ransohoff, Inc., Cincinnati, Ohio.

AUTOMATIC POLISHING MACHINES

Acme Mfg. Co., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hammond Mach. Builders, Inc., Kalamazoo, Mich.

AUTOMATIC WIRE AND SHEET METAL WORKING MACHINERY

Baird Machine Co., Bridgeport, Conn.

BALL BURNISHING EQUIPMENT (Also see Burnishing and Polishing Barrels.)

Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
N. Ransohoff, Inc., Cincinnati, Ohio.

BASKETS, DIPPING

General Ceramics Co., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLAST GATES

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLOWERS AND BLOW PIPING (See also Exhaust Fans and Heads.)

Allington & Curtis Co., Saginaw, Mich.
Astle, H. J. & Co., Providence, R. I.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Monarch Engineering & Mfg. Co., Baltimore, Md.

BLOWERS AND EXHAUSTERS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BLOWER SYSTEMS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BRASS FINISHERS' SOAP

Magnus Chemical Co., Garwood, N. J.

BRASS MILL PRODUCTS

Baltimore Brass Co., Baltimore, Md.
Seymour Mfg. Co., Seymour, Conn.
Western Cartridge Co., East Alton, Ill.

BRASS; SHEET, WIRE, ROD, TUBE (Also see Wire Mill Products, Rods and Bars, Sheets; Strip Metals; Tubes; Wire, Etc.)

American Brass Co., Waterbury, Conn.
Bristol Brass Co., Bristol, Conn.
Seymour Mfg. Co., Seymour, Conn.
Steel Sales Corp., Chicago, Ill.
Western Cartridge Co., Alton, Ill.
Waterbury Rolling Mills, Waterbury, Conn.

BRIGHTENERS (For Plating Solutions.)

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BRONZE (See Also Anodes; Castings; Forgings; Ingots; Powdered; Rods and Bars; Tubes, Etc.)

Western Cartridge Co., Alton, Ill.

Phosphor, Tobin, Manganese

Seymour Mfg. Co., Seymour, Conn.
Steel Sales Corp., Chicago, Ill.

BRONZING LIQUID

Ault & Wiborg Corp., New York.
Egyptian Lacquer Mfg. Co., New York.
Zapon Co., The, Stamford, Conn.

BRUSHES

Hand

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Wheel

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFING COMPOUND CLEANERS

International Chemical Co., Philadelphia, Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York.

BUFFING AND POLISHING COMPOSITION

Beam-Knodel, Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Chciago, Ill.—Glen Ridge, N. J.

BUFFING AND POLISHING MACHINES

Acme Mfg. Co., Detroit, Mich.
Production Machine Co., Greenfield, Mass.

Electric

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFING MACHINES, AUTOMATIC (Also see Polishing Lathes and Heads.)

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFING AND POLISHING WHEELS (Also see Buffs.)

Canvas, Cotton, Etc.

Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lea Mfg. Co., The, Waterbury, Conn.
MacFarland Mfg. Co., Long Island City, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
The Matchless Metal Polish Co., Glen Ridge, N. J.
Williamsville Buff Mfg. Co., Danielson, Conn.
Yerges Buff Co., Fremont, Ohio.

Felt

Bacon Felt Co., Winchester, Mass.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
Yerges Buff Co., Fremont, Ohio.

Leather

Hanson-Van Winkle-Munning Co., Matawan, N. J.

Sheepskin

Hanson-Van Winkle-Munning Co., Matawan, N. J.

BUFFS (Also see Buffing and Polishing Wheels.)

Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacDermid Incorporated, Waterbury, Conn.
MacFarland Mfg. Co., Long Island City, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.
Williamsville Buff Mfg. Co., Danielson, Conn.
Yerges Buff Co., Fremont, Ohio.

BUFFS, STAINLESS STEEL

Hanson-Van Winkle-Munning Co., Matawan, N. J.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
MacFarland Mfg. Co., Long Island City, N. Y.
Williamsville Buff Mfg. Co., Danielson, Conn.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 40*

BURNERS (Also see Furnaces.)

Air and Gas Pre-Mixing

Monarch Engineering & Mfg. Co., Baltimore, Md.

Burnishing and Polishing Barrels

Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Ransohoff, N., Inc., Cincinnati, Ohio.
Smith-Richardson Co., Attleboro, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

BURNISHING COMPOUNDS AND CHIPS (Also see Soap.)

International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York.

BURNISHING MACHINES

Abbott Ball Co., The, Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.

CADMIUM

Grasselli Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

CADMIUM OXIDE

Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

CADMIUM PLATING

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

CAUSTIC SODA

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
McGean Chemical Co., The, Cleveland, Ohio.

CHEMICALS, DEALERS IN ALL KINDS (Also see Kind Wanted.)

Platers

Cooper & Co., Chas., New York.
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

CHLORIDE

Nickel

Harshaw Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.

CHROMIC ACID

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

CHROMIUM PLATING PROCESS

United Chromium, Inc., New York.

CHROMIUM PLATING TANKS

American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
General Ceramics Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
United States Rubber Co., New York.

CHROMIUM PLATING MACHINERY

Chas. F. L'Hommedieu & Sons., Chicago, Ill.
The Meaker Company, Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

CHROMIUM PLATING FUMES EXHAUST SYSTEMS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

CHROMIUM PLATING POLISH

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

CHUCKING MACHINES, AUTOMATIC

Baird Machine Co., Bridgeport, Conn.

CLEANERS, METAL

Ford, J. B. Co., Wyandotte, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
The Meaker Company, Chicago, Ill.
Oakite Products, Inc., New York.
Philadelphia Quartz Co., Philadelphia, Pa.
Sulphur Products Co., Greensburg, Pa.
Udylite Process Co., Detroit, Mich.

CLEANING APPARATUS, AUTOMATIC METAL

(Also see Pickling Machines.)

Meaker Company, The, Chicago, Ill.
Ransohoff, N., & Co., Cincinnati, Ohio.

CLEANING COMPOUNDS (See also Fig Cleaner; Pickling Compounds, Whale Oil Soaps.)

Metal

Ford, J. B., Co., Wyandotte, Mich.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York.
Philadelphia Quartz Co., Philadelphia, Pa.
Stevens, Inc., Frederic B., Detroit, Mich.

CLEANING SYSTEMS (Vacuum.)

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

COCK GRINDERS

COLLECTING SYSTEMS (Dust, Shavings, Sawdust, Dust Metal.)

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

COMMUTATORS

Belke Mfg. Co., Chicago, Ill.

COMPOSITION METAL (See Castings; Ingot, Etc.)

Greaseless for Metal Finishing

Lea Mfg. Co., The, Waterbury, Conn.

COMPOSITIONS (See Buffing and Polishing Composition; Flooring Composition.)

Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.

COMPOUNDS, CUTTING AND GRINDING DRAWINGS, STAMPING

International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.

CONVEYING SYSTEMS (Pneumatic Light and Heavy Materials.)

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

COPPER (Also see Anodes; Castings; Ingots; Rods and Bars; Sheets; Smelters and Refiners; Strip Metal; Tubes; Wire, Etc.)

Sheet, Wire, Rod, Tube

American Brass Co., Waterbury, Conn.

COPPER BEARING MATERIAL, BUYERS OF (See Drosses, Residues, Etc.)

COPPER CARBONATE OF

Cooper, Chas. & Co., New York, N. Y.
du Pont de Nemours & Co., E. I., Inc., The, R. & H. Chemicals Dept., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

COPPER-CYANIDE

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

CORE MACHINES

Stevens, Inc., Frederic B., Detroit, Mich.

CORE OIL AND COMPOUNDS

Stevens, Inc., Frederic B., Detroit, Mich.

CORE OVEN INSULATION (See Brick Insulating; Insulating Cement; Insulating Oven.)

Monarch Engineering &. Mfg. Co., Baltimore, Md.

CORE OVENS

Coal and Coke

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Inc., Frederic B., Detroit, Mich.

Oil and Gas

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Stevens, Inc., Frederic B., Detroit, Mich.

CRUCIBLES, METAL MELTING

Stevens, Inc., Frederic B., Detroit, Mich.

CUPOLETTES

Monarch Eng. & Mfg. Co., Baltimore, Md.

CUPOLA AND FURNACE, FIRE CLAY AND CEMENT

Monarch Eng. & Mfg. Co., Baltimore, Md.

CUTTING, STRAIGHTENING FORMING & EXTRUDING MACHINERY

Wire

Baird Machine Co., Bridgeport, Conn.

Strip Metal

Baird Machine Co., Bridgeport, Conn.

CYANIDES

Hanson-Van Winkle-Munning Co., Matawan, N. J.
McGean Chemical Co., The, Cleveland, Ohio.

CYANIDE OF SODIUM

du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

DIPPING BASKETS

Dipping and Plating

Allington & Curtis Co., Saginaw, Mich.
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.
United States Rubber Co., New York.

Stoneware

General Ceramics Co., New York.

DRYING-OUT MACHINES (See also Centrifugal Dryers and Extractors; Sawdust Drying-Out Boxes.)

Baird Machine Co., Bridgeport, Conn.
Smith-Richardson Co., Attleboro, Mass.
Udylite Process Co., Detroit, Mich.

Automatic

Astle, H. J., & Co., Providence, R. I.

DUST ARRESTORS

Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Cloth Screen

DUST COLLECTORS AND VENTILATING SYSTEMS (Also see Exhaust Fans and Heads.)

Allington & Curtis Co., Saginaw, Mich.
Astle, H. J., & Co., Providence, R. I.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 40*

DUST COLLECTING OUTFIT, POLISHING
Astle, H. J., & Co., Inc., Providence, R. I.
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

DYNAMOS, LOW VOLTAGE, PLATING AND GALVANIZING (Also see Electrical Apparatus and Equipment.)
Bogue, Chas. J., Electric Co., New York, N. Y.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Meaker Company, Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

DYNAMOS, PLATING, USED
M. E. Baker Co., Boston, Mass.
Holland J., Sons, Brooklyn, N. Y.

ELECTRIC OVENS
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

ELECTRICAL APPARATUS AND EQUIPMENT (Also see Ammeters, Rheostats, Switchboards, Transformers, Voltmeters.)
Bogue, Chas, J., Electric Co., New York.
Udylite Process Co., Detroit, Mich.

ELECTRO GALVANIZING EQUIPMENT AND SUPPLIES (See Dynamos; Plating Barrels; Plating Machines, Automatic; Tanks, Etc.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Meaker Company, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
Beam-Knodel, Inc., Chicago, Ill.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago, Ill.
Meaker Company, The, Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

ELECTRO PLATING, JOB & CONTRACT (Also see Polishing and Burnishing; Plating, Barrel Method.)

ELECTRO PLATING & GALVANIZING BARRELS
Beam-Knodel, Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

ELECTRO PLATING TANKS
American Hard Rubber Co., New York.
General Ceramics Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
United States Rubber Co., New York.

ELECTROTYPING EQUIPMENT & SUPPLIES
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker Company, The, Chicago, Ill.

EMERY (Also see Abrasives.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
Stevens, Inc., Frederic B., Detroit, Mich.

EMERY PASTE
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

ENAMEL STRIPPERS
Magnuson Products Corp., Brooklyn, N. Y.

ENAMELS
Colored
Agate Lacquer Co., Long Island City, N. Y.
Ault & Wiborg Corp., New York.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

Lacquer
Agate Lacquer Co., Long Island City, N. Y.
Ault & Wiborg Corp., New York.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

Wood
Agate Lacquer Co., Long Island City, N. Y.
Ault & Wiborg Corp., New York.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.

ENGINEERS
Consulting Chemists
International Chemical Co., Philadelphia, Pa.

Furnace
Monarch Engineering & Mfg. Co., Baltimore, Md.

EQUIPMENT
Chromium Plating
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Meaker Company, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

Electro Plating
Hanson-Van Winkle-Munning Co., Matawan, N. J.

ETHYL ACETATE
Zapon Co., The, Stamford, Conn.

EXHAUST SYSTEMS
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

EXTRUDED SHAPES
Brass, Copper and Bronze

EYE PROTCETORS
Chicago Eye Shield Co., Chicago, Ill.

FANS (Exhaust.)
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

FEEDERS (Furnace, Wood Waste.)
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

FELT, POLISHING
Bacon Felt Co., Winchester, Mass.
Eastern Felt Co., Winchester, Mass.

FELT POLISHING WHEELS
Bacon Felt Co., Winchester, Mass.
Eastern Felt Co., Winchester, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.

FELT SHEETS
Bacon Felt Co., Winchester, Mass.
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

FELT WHEELS
Bacon Felt Co., Winchester, Mass.
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

FIG CLEANERS (Also see Cleaning Compounds, Whale Oil Soap.)
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.

FILTER AERATING & AGITATING SYSTEM
Belke Mfg. Co., Chicago, Ill.

FILTER SYSTEM FOR PLATING SOLUTIONS
Belke Mfg. Co., Chicago, Ill.

FILTER, TANK
Belke Mfg. Co., Chicago, Ill.

FIRE CEMENT
Monarch Eng. & Mfg. Co., Baltimore, Md.

FLUXES
Brazing, Soldering, Thinning and Welding
Grasselli Chemical Co., The, Cleveland, Ohio.
Steel Sales Corp., Chicago, Ill.

FOUNDRY FACINGS
Stevens, Inc., Frederic B., Detroit, Mich.

FURNACE STOKERS
Refuse and Wood Fuel
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

FURNACES (See Annealing Furnaces; Burners; Electric Furnaces; Galvanizing & Tinning Furnaces; Heat Treating Furnaces; Melting Furnaces; Powdered Coal Burning Furnaces; Sherardizing Furnaces; Smelting Furnaces.)
Fisher, Alfred, Furnace Co., Cicero, Ill.

FUSE METAL
Platt Bros. & Co., Waterbury, Conn.

GALVANIZING AND TINNING FURNACES (Also see Burners.)

GALVANIZING EQUIPMENT AND SUPPLIES
(See Kinds Wanted. Also Plating Galvanizing Machines. Automatic; Hot and Galvanizing Barrels; Plating and Galvanizing and Tinning Equipment.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker Company, The, Chicago, Ill.
Udylite Process Co., Detroit, Mich.

GENERATORS (See Dynamos; Motor-Generator Sets.)
Beam-Knodel, Inc., New York.
Bogue Electric Co., Chas. J., Hoboken, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker Company, The, Chicago, Ill.
Stevens Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

GLUE FOR POLISHING
Hanson-Van Winkle-Munning Co., Matawan, N. J.

GLUE HEATERS AND POTS
Hanson-Van Winkle-Munning Co., Matawan, N. J.

GOLD (See Anodes; Bars; Metal Dealers; Smelters and Refiners.)

GRAPHITE PRODUCTS, POSPHORIZERS, STIRRERS, ETC.
(Inquire Metal Industry, New York)

GREASELESS COMPOSITIONS
Lea Mfg. Co., The, Waterbury, Conn.
The Matchless Metal Polish Co., Glen Ridge, N. J.

GRINDERS & BUFFERS
Electric
Hammond Mach. Builders, Inc., Kalamazoo, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Production Mach. Co., Greenfield, Mass.

GRINDING COMPOUNDS
International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc.. New York.

GRINDING MACHINES
Hammond Mach. Builders, Inc., Kalamazoo, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Portable

HARD RUBBER FITTINGS
American Hard Rubber Co., New York.
Udylite Process Co., Detroit, Mich.
Pipe
Belke Mfg. Co., Chicago, Ill.
Udylite Process Co., Detroit, Mich.
Hard Rubber Tanks
American Hard Rubber Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
United States Rubber Co., New York.

HOODS (Also see Dust Collectors and Ventilating Systems.)
Allington & Curtis Mfg. Co., The, Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

HYDROGEN PEROXIDE
McGean Chemical Co., The, Cleveland, Ohio.

INGOTS (Also see Calcium-Copper; Manganese-Copper; Phosphor-Copper; Phosphor-Tin; Silicon-Copper; Smelters and Refiners.)
Aluminum
British Aluminium Co., Ltd., The, New York.
Strahs Aluminum Co., New York.

INSULATION (Also see Brick, Insulating, Insulating Cement.)
Pipe
American Hard Rubber Co., New York, N. Y.
Goodrich Rubber Co., B. F., Akron, Ohio.
United States Rubber Co., New York.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 40*

JAPAN REMOVERS
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.

JAPANS, ALL KINDS
Zapon Co., The, Stamford, Conn.

JEWELERS' EQUIPMENT (Also see Kind Wanted.)
Smith-Richardson Co., Attleboro, Mass.

LACQUER ENAMELS (See Enamels.)
Zapon, The, Co., Stamford, Conn.

LACQUERS
Colored
Agate Lacquer Co., Long Island City, N. Y.
Ault & Wiborg Corp., New York.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.
For Incandescent Lamps
Zapon, The, Co., Stamford, Conn.
Metal
Agate Lacquer Co., Long Island City, N. Y.
Ault & Wiborg Corp., New York.
Egyptian Lacquer Mfg. Co., New York.
Maas & Waldstein Co., Newark, N. J.
Zapon, The, Co., Stamford, Conn.
Wood
Agate Lacquer Co., Long Island City, N. Y.
Ault & Wiborg Corp., New York.
Egyptian Lacquer Mfg. Co., New York.
Zapon, The, Co., Stamford, Conn.

LACQUER REMOVERS
Egyptian Lacquer Mfg. Co., New York.
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York.
Zapon, The, Co., Stamford, Conn.

LADLE HEATERS AND DRYERS
Monarch Engineering & Mfg. Co., Baltimore, Md.

LATHES (See also Polishing Lathes.)
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Polishing
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

LEAD BURNING
Abernethy, John F., & Co., Inc., Brooklyn, N. Y.

LUBRICANTS (Cutting and Grinding, Drawing, Stamping.)
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York.

MACHINERY
Cleaning Metal (Mech.)
N. Ransohoff, Inc., Cincinnati, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
Dry Metal (Mech.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
Metal Drying
Ransohoff, N., Co., Inc., Cincinnati, Ohio.
Pickling Metal (Mech.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Meaker Company, Chicago, Ill.
N. Ransohoff, Inc., Cincinnati, Ohio.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.
Galvanizing (Mechanical)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
Plating (Mechanical)
Hanson-Van Winkle-Munning Co., Matawan, N. J.

MANGANESE-COPPER (Also see Ingots.)
(Inquire Metal Industry, New York)

MANTLE DIP
Zapon Co., The, Stamford, Conn.

MELTING FURNACES (Also see Burners; Galvanizing and Tinning Furnaces; Tank Furnaces.)
Pit
Stevens, Inc., Frederic B., Detroit, Mich.

METAL CLEANERS (See also Cleaning Compounds.)
Ford, J. B., Co., Wyandotte, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
International Chemical Co., Philadelphia, Pa.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., Brooklyn, N. Y.
Philadelphia Quartz Co., Philadelphia, Pa.
Sulphur Products Co., Greensburg, Pa.
Udylite Process Co., Detroit, Mich.

METAL DEALERS (Also see Drosses, Residues, Etc., Buyers of: Turnings, Chips, Anodes, Etc., Buyers of.)
Gold, Silver, Platinum
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Metallurgical Products Co., Philadelphia, Pa.
Rare Metals
Radnai, Josef, New York.

METAL DRYERS, CENTRIFUGAL
Ransohoff, N., Inc., Cincinnati, Ohio.

METAL POLISH
Harrison & Co., Haverhill, Mass.
International Chemical Co., Philadelphia, Pa.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Chicago, Ill.—Glen Ridge, N. J.

MOLDS (See also Mold Makers.)
Babbitt and Solder
Schweizer, Chas. K., St. Louis, Mo.
Ingot
Schweizer, Chas. K., St. Louis, Mo.

MONEL METAL POLISH
International Chemical Co., Philadelphia, Pa.

MOTORS (Also see Electrical Apparatus and Equipment.)
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.

MOTOR-GENERATOR SETS (Also see Dynamos; Electrical Apparatus and Equipment.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. P. L'Hommedieu & Sons, Chicago, Ill.
The Meaker Company, Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.
Plating and Galvanizing
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.
U. S. Galvanizing & Plating Equipment Corp., Brooklyn, N. Y.

MUNTZ METAL (See Sheets.)

MUSIC ENGRAVERS' PLATES
Standard Rolling Mills, Inc., Brooklyn, N. Y.

NICKEL CARBONATE, MOIST AND DRY
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington ,Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

NICKEL CHLORIDE
Cooper & Co., Chas., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.

NICKEL DETERMINATION APPARATUS
(Inquire Metal Industry, New York)

NICKEL SALTS
du Pont de Nemours & Co., E. I., Inc., The A. & H. Chemicals Dept., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.
MacDermid, Inc., Waterbury, Conn.
McGean Chemical Co., The, Cleveland, Ohio.
Stevens, Frederic B., Detroit, Mich.

NICKEL SHOT
Seymour Mfg. Co., Seymour, Conn.

NICKEL SILVER (See also Brass, Sheets, Wire, Rod, Tube Castings; Forgings, Sheets; etc.)
Western Cartridge Co., Alton, Ill.
Sheets, Wire, Rod, Tube
Seymour Mfg. Co., Seymour, Conn.
Steel Sales Corp., Chicago, Ill.
Waterbury Rolling Mills, Waterbury, Conn.

NICKEL SULPHATE, SINGLE AND DOUBLE
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio.

OVENS (Also see Burners; also Core Ovens.)
Enameling, Lacquering, Japanning
Allington & Curtis Co., Saginaw, Mich.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

OXIDIZING SOLUTIONS
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Sulphur Products Co., Greensburg, Pa.

PEWTER
(Inquire Metal Industry, New York)

PHOSPHOR BRONZE (See also Ingots.)
Western Cartridge Co., Alton, Ill.

PHOSPHORUS
General Chemical Co., Philadelphia, Pa.

PICKLING TANKS
American Hard Rubber Co., New York, N. Y.
General Ceramics Co., New York.
Kirk & Blum Mfg. Co., Cincinnati, Ohio.

PINE AND FITTINGS
Acid Proof, Hard Rubber
American Hard Rubber Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
United States Rubber Co., New York.

PLATED AND POLISHED SHEET METALS (See also Sheets.)
American Nickeloid Co., Peru, Ill.

PLATERS' BUCKETS, DIPPERS & PITCHERS
Belke Mfg. Co., Chicago, Ill.

PLATER CHEMICALS AND ACIDS
International Chemical Co., Philadelphia, Pa.

PLATERS METAL
(Inquire Metal Industry, New York)

PLATERS' SUPPLIES
Beam-Knodel, Inc., New York.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

PLATING
Cadmium
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Grasselli Chemical Co., The, Cleveland, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

PLATING BARRELS, ROTARY
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PLATING AND GALVANIZING BARRELS
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker Company, The, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PLATING AND GALVANIZING MACHINES, AUTOMATIC (Also see Plating Barrels.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker Company, The, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PLATING EQUIPMENT AND SUPPLIES (See also Kind Wanted.)
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Meaker Company, The, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PLATING GENERATORS
Bogue Electric Co., Chas. J., Hoboken, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Holland, J., & Sons, Brooklyn, N. Y.
Meaker Company, The, Chicago, Ill.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

PLATING MATERIALS
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., Cleveland, Ohio.
McGean Chemical Co., The, Cleveland, Ohio.
Stevens, Inc., Frederic B., Detroit, Mich.
Udylite Process Co., Detroit, Mich.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

(Advertisers are entitled to one listing for each sixteenth page of space)

To Locate Advertisements of Firms Listed Below Refer to Alphabetical Index Page 40*

PLATING RACKS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

PLATING SOLUTION AGITATOR
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.

PLATING SOLUTION FILTER SYSTEM
Belke Mfg. Co., Chicago, Ill.

PLATING TANKS
American Hard Rubber Co., New York, N. Y.
General Ceramics Co., New York.
Goodrich Rubber Co., B. F., Akron, Ohio.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
The Meaker Company, Chicago, Ill.
Udylite Process Co., Detroit, Mich.
United States Rubber Co., New York.
U. S. Galv. & Plating Equip. Corp., Brooklyn, N. Y.

PNEUMATIC CONVEYORS
Bulk Materials
Allington & Curtis Mfg. Co., The, Saginaw, Mich.

POLISHERS, FLOOR AND BENCH
Acme Mfg. Co., Detroit, Mich.
Astle, H. J., & Co., Providence, R. I.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Production Mach. Co., Greenfield, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING ABRASIVES
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

POLISHING CEMENT
M. P. Iding Disc Grinding Compound Co., Milwaukee, Wis.

POLISHING COMPOSITIONS (See Buffing and Polishing Compositions.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., The, Waterbury, Conn.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING EQUIPMENT AND SUPPLIES (See also Kinds Wanted.)
Beam-Knodel, Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.
Used
Baker, M. E. Co., The, Boston, Mass.

POLISHING FELTS
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

POLISHING LATHES AND HEADS
Electric
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Production Mach. Co., Greenfield, Mass.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING MACHINES (Also see Polishing Lathes and Heads.)
Automatic
Acme Mfg. Co., Detroit, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Stevens, Inc., Frederic B., Detroit, Mich.

POLISHING MATERIALS
Beam-Knodel, Inc., New York.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lea Mfg. Co., Waterbury, Conn.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
MacFarland Mfg. Co., Long Island City, N. Y.

POLISHING WHEELS (See also Buffing and Polishing Wheels.)
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
The Matchless Metal Polish Co., Glen Ridge, N. J.
Yerges Buff Co., Toledo, Ohio.

POTASH
First Sorts
Harshaw Chemical Co., The, Cleveland, Ohio.
Real
Harshaw Chemical Co., The, Cleveland, Ohio.

POTASSIUM CYANIDE
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, Ohio.
Udylite Process Co., Detroit, Mich.

PRESSES (Also see Scrap Baling Machine.)
Bench and Foot
Baird Machine Co., Bridgeport, Conn.
Power, All Types
Baird Machine Co., Bridgeport, Conn.

PROCESS (Chromium)
United Chromium, Inc., New York.

PUMPS
Hard Rubber, Acid Proof
American Hard Rubber Co., New York.
The Duriron Co., Inc., Dayton, Ohio.
Goodrich Rubber Co., B. F., Akron, Ohio.
United States Rubber Co., New York.

CENTRIFUGAL PYROMETERS (For Brass and Aluminum.)
Illinois Testing Laboratories, Inc., Chicago, Ill.

RACKS—RUBBER COVERING FOR
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Goodrich Rubber Co., B. F. Akron, Ohio.
United States Rubber Co., New York.
Plating
Belke Mfg. Co., Chicago, Ill.

RHEOSTATS (See also Electrical Apparatus and Equipment.)
Beam-Knodel, Inc., New York.
Belke Mfg. Co., Chicago, Ill.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylite Process Co., Detroit, Mich.

RESPIRATORS
Chicago Eye Shield Co., Chicago, Ill.

RHODIUM (Inquire)
Metal Industry, New York, N. Y.

RODS AND BARS (Also see Brass Mill Products.)
Aluminum
Strahs Aluminum Co., New York.

ROUGE (See also Buffing and Polishing Compositions.)
Harrison & Co., Haverhill, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.
Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.

RUBBER TANKS
American Hard Rubber Co., New York.
Belke Mfg. Co., Chicago, Ill.
Goodrich Rubber Co., B. F., Akron, Ohio.
United States Rubber Co., New York.

RUST PREVENTATIVES
International Chemical Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York.

RUST PROOF PROCESS
du Pont de Nemours & Co., E. I., Inc., The R. & H. Chemicals Dept., Wilmington, Del.
Udylite Process Co., Detroit, Mich.

RUST REMOVERS
International Chemical Co., Philadelphia, Pa.
Oakite Products, Inc., New York.

SAND BLASTS (Inquire)
Cabinet
Astle, H. J., & Co., Providence, R. I.
Leiman Bros., Newark, N. J.

SAWDUST DRYING-OUT BOXES (Also see Drying-Out Machines.)
Ransohoff, N., Inc., Cincinnati, Ohio.
Smith-Richardson Co., Attleboro, Mass.

SHEEPSKIN POLISHING WHEELS
Hanson-Van Winkle-Munning Co., Matawan, N. J.
MacFarland Mfg. Co., Long Island City, N. Y.

SHEET FELT
Eastern Felt Co., Winchester, Mass.
MacFarland Mfg. Co., Long Island City, N. Y.

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Harrison & Co., Haverhill, Mass.
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Matchless Metal Polish Co., Glen Ridge, N. J.—Chicago.
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Astle, H. J. & Co., Providence, R. I.
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Hanson-Van Winkle-Munning Co., Matawan, N. J.

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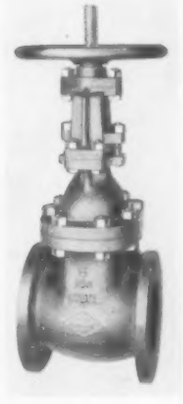

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